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NOW READY—THE NEW (4th) EDITION

# MacCallum's PATHOLOGY

**T**he New (4th) Edition presented after most thorough revision. Few pages indeed have escaped addition or improvements from Dr MacCallum's tireless pen. Many new illustrations have been added. Some of the subjects receiving important improvements or greater emphasis are Calcium metabolism wandering cells, anaphylaxis and all types of endocarditis bronchopneumonia nephritis cutaneous lymphogranuloma cerebral hemorrhage exanthematic diseases hemolytic anemia sickle cell anemia diabetes mellitus goiter tetany functions of adrenal gland disturbances of the hypophysis, cysts tumors denervation elements of the nervous system, tumors of the brain tumors of the liver tertiary circulatory disturbances streptococcal infection tuberculosis typhus undulant fever diphtheria formation of melanins obliteration of endocarditis mechanical and infectious injury to arteries thyroid gland disturbances heredity in the development of tumors and diseases related to specific diseases.

Dr MacCallum's presentation of pathology on the basis of etiology has given his book peculiar interest and value. Treatment of the subject by the limited histological and morphological description but discusses well functional disturbances disturbances of chemical character—even symptoms. The author co-ordinates pathology and clinical medicine so closely that the student easily sees the practical application.

By W. G. MacCallum, M.D., Professor of Pathology and Bacteriology, Johns Hopkins University. Octavo, 77 pages, 12 illustrations, bound in cloth. Cloth, \$ 0.00 net.

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that surgery is tested I shall therefore discuss appendicitis in relation to the peritoneal reaction secondary to the disease

TABLE I

W	A	A	ases	ca h	ortal er cen
W t t d j	I	I t	46	2	0 8
W t h f f d			12	5	3 9
A t d f f p	t		73	15	17 8
Absc			133	5	3 7

We may classify these cases in three groups

- (1) Where free fluid exists which may or may not be cloudy
- (2) Abscess
- (3) Diffuse or spreading peritonitis

The first advance during the last ten years is the decrease in the incidence of post operative peritonitis in the case of the drain. This has been accomplished by suturing the peritoneum about the drain and leaving the remainder of the wound wide open but loosely packed with iodoform gauze

TABLE II

A	I	II	I
F m 0 t 10		49	5 1 1
F m 11 t 0		180	10 5 5
F m 21 t 30		157	1 7 7
F m 31 t 40		0	7 10 0
F m 41 50		39	11 8 2
F m 51 t 60		4	1 25 0
F m 61 0		1	0 0 0

In my series the average 15 per cent post operative peritonitis occurred in the drained cases. Following the procedure of merely closing the peritoneum the percentage of hemorrhage went down more than 3 per cent. It will be noted that a paracutaneous puncture infection. When the fascia is sutured it becomes traumatized and the blood proliferates. It is therefore more susceptible to infection. In a series of cases treated frequently the wound has to be opened but the fifth

day postoperative and the foul smelling sloughing fascia removed. By merely suturing the peritoneum the incidence of the sloughing fascia is greatly diminished.

The hospital days have been shortened by this procedure and Table II in reference to age decade of postoperative hernia show conclusively I believe that a potential postoperative hernia occurs before the patient leaves the hospital. One can see that in the active age of life that is the decade between eleven and thirty when hard work is necessary postoperative herniae are relatively small while the percentage increases from this age on and is also high in the first decade. It is evident that the formation of hernia therefore is influenced by poor musculature and lowered resistance.

The second advance during this decade has been jejunostomy for either mechanical or paralytic ileus. Particularly in paralytic ileus occurring about the fifth or sixth day postoperative is jejunostomy a life saving procedure. While many authors decry its advisability because its percentage of cures may not be over 40 per cent still it must be realized that this 40 per cent represents desperately ill cases who would probably not survive if this procedure were not adopted.

The third important step has been the use of hypertonic saline for obstruction as described by Haden and Orr. They have shown that there is a sodium chloride retention in obstructive cases and that patients can withstand the toxemia much better if given hypodermic saline intravenously or subcutaneously.

The past ten years have not reduced the mortality to any startling degree in peritonitis or abscess cases. Our mortality in diffuse peritonitis was 17.8 per cent while Cutler's was 28.3 per cent. No true comparison may be made really between the series because the individual opinion of one operator formed by inspection through a relatively small incision cannot be interpreted the same as another's. One series of surgeon might have one criterion for peritonitis and another group another. It is however quite evident that allowing this limit of error we have not progressed to an astonishing degree. To



cut down this mortality during the ensuing ten year it would seem that the following factor might be utilized

1 **Public Education of the Doctors to Diagnose Appendicitis Early and Refer These Patients Immediately for Operation**—The advance with early operation is easily shown when one realizes that in our series of 740 cases closed without drainage there were only two deaths a mortality of 0.83 per cent while in the 544 delayed cases there were 73 deaths or a mortality of 6.8 per cent which jumped to 1 per cent in the diffuse peritonitis cases

2 **Improved Anesthesia**—With the introduction of ethylene and gas and oxygen anesthesia by trained anesthetist and also improved method of paravertebral and local anesthesia with muscle block one might look for a definite advance. There is however one factor still hindering the progress. In most metropolitan hospital acute appendicitis cases are admitted at night. In hospital where there is no resident anesthetist the administration of anesthesia is usually delegated to a junior member of the internal staff who is obviously inexperienced. It would seem the fact that we must attempt either to have resident anesthesiologists or have anesthetist on call for emergency operation in a manner similar to attendance surgeon on call. This is an obligation that I believe we definitely owe to the acutely ill emergency patient.

3 **The use of the Levin tube** as a mild duodenal tube that may be inserted through the nose into the stomach and duodenum at the time of operation. We all too readily accept the necessity of rest of abdominal organs post operation and let little hands bandage the costal orifices of the patient's chest and postoperative rigidity. When the Levin tube is used we permit the emergency patient to drink a limited amount of water. This is prophylactic against infection through the Levin tube. We have found that this method is almost eliminated by this method. If possible the amount of postoperative ileus that occurs with incision the amount of intra peritoneal action that results from the peritoneal incision of the diaphragm one can see that these are prophylactic in

the spread of peritonitis and their control or elimination must do a great deal to prevent spread of infection. Moreover frequent lavage is very trying on the nervous system and the physical condition of a postoperative patient.

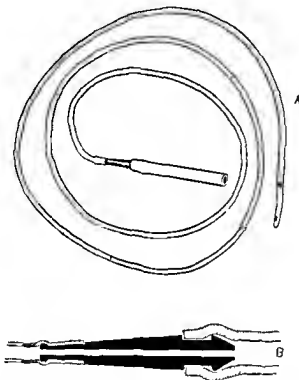


Fig. 308.—(A) Diagram of the tube with the catheter. (B) The tube supplied with drainage.

4 Improved Drainage and Improved Methods of Selection for Drainage in Peritonitis Cases.—It is known that free peritoneal drainage probably does not occur after twenty-four hours. With the patient in Fowler's position the pelvis is the natural receptacle for gravity drainage. Insertions of drains through the McBurney or right rectus incision into the pelvis are rela-

tively unsmooth. It is a long tract uphill and usually curved as the drainage material proceeds over the crest of the pelvis. If following the removal of the appendix a finger is inserted

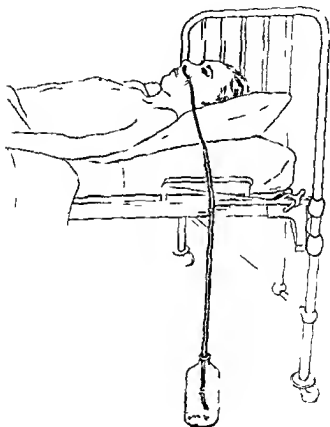


Fig. 309.—Levin tube

through the incision to the meatus immediately above the pubis to palpate and mark certain points in the bladder region and then a small incision made through the skin and

fascia and a Kelly clamp inserted guided by the finger in the peritoneal cavity drainage can be safely made and a tube may be inserted to the culdesac guided by the intra abdominal finger. This prolongs the operation a very short time and provides adequate drainage of septic material for at least twenty four hours. We believe that in peritonitis cases with pelvic

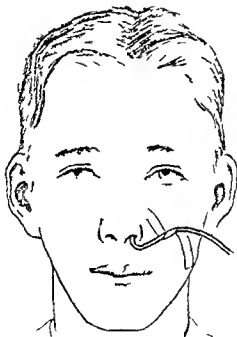


Fig 310—L t b

collections this is a satisfactory procedure and will save a certain number of cases.

5 The Use of Hypertonic Saline for Ileus and Repeated Transfusions for Sepsis Will Help the Patient to Overcome Toxemia and Should be More Generally Adopted.—We believe that Haden and Orr have made a definite contribution to this subject.

6. An improved knowledge of the condition of acidosis and alkalosis and their routine employment so that the postoperative toxemias may be treated in a scientific manner.

In order to provide a basis for future comparison the routine treatment by the surgical staff of the Fifth Avenue Hospital of patients suffering from acute appendicitis with accompanying peritonitis is hereby given.

A hypothetical case enters the hospital with a three day history of appendicitis and clinical signs of peritonitis. The patient is given a preliminary dose of morphine and prepared for operation. If the patient has been vomiting profusely and there is therefore marked loss of fluid balance a hypodermoclysis of either saline or 5 per cent glucose is immediately given.

If there is distention and tenderness in the right lower quadrant catharsis through the mouth is made. The patient is taken to the operating room and according to the severity of the illness either ethylene oxide or local anesthesia with muscle block is used.

The incision is still one for McBurney. The McBurney incision has the advantages that the approach is direct to the peritoneal cavity and therefore not peritoneal incision in absence case. It does not cut important vessels or nerves and if drainage is necessary the drainage matter is to the exterior. It does not cross any important vessels. It has the disadvantage that unless one is fully aware of the different methods of incising the incision it does not afford the satisfactory exposure of a difficult dissection. If one uses the Weber incision for right appendicitis and a cross cut of the muscle of the right iliac lying upward and retroperitoneally a satisfactory exposure can be obtained. For difficult retroperitoneal appendicitis the right stoneum may be split laterally to the cecum and the incision and the bowel rotated laterally all in a satisfactory manner without interference with the blood supply.

A right rectus incision in general permits a more direct and better exposure of the appendix and cecum than the following advantages.

1 Very frequently the deep epigastric artery and vein are apt to be traumatized and if thrombosis occurs in the vessel there is a greater possibility of a later embolic process.

2 Nerves supplying the rectus muscle may be cut with a resultant paralysis of the rectus muscle lying mesial to the incision.

3 If drainage to the cecal base is advisable the drain has to cross the terminal ileum and lie in an oblique manner which is physiologically unsound first from the standpoint of drainage and second from the likelihood of later band formation which may cause obstruction.

4 In the series above quoted there was a higher percentage of herniæ in cases where the right rectus incision had been used. In 258 cases in which the McBurney incision was employed there were 38 herniæ (14.7 per cent) and in 37 cases with a right rectus incision there were 7 herniæ (21.6 per cent). While this series is too small for strict deductions it shows nevertheless a distinct increase in herniæ in the right rectus over the McBurney incision.

In general therefore we recommend the McBurney incision. Any free fluid appearing in the incision is removed by the sucker. Small string pads are inserted immediately after opening the peritoneum on each side of the incision in order to protect the muscle and fascia from infection. The appendix is rapidly sought. If the cecal base is not indurated the appendix is excised between clamps about 1 cm. from its cecal junction and the stump inverted, care being taken first to isolate and ligate the small appendiceal vessel which travels along the cecal wall to the base of the stump. If this vessel is isolated and ligated there is not much likelihood of secondary bleeding into the bowel. The stump is then inverted with a pure string suture and a second reinforcing suture applied.

We believe this method is superior to the intramural implantation of the stump because in these cases a certain number of secondary abscesses have been created in the cecal wall which have either ruptured into the bowel or secondarily into the abdominal cavity. If the cecal wall is indurated a heavy

leature is put about the appendiceal stump and no attempt at inversion made. In such a case it is necessary to insert drains in the region of the stump.

If the peritonitis is diffuse and there is a collection in the pelvis a sucker is introduced and the excess fluid removed. The pelvis is drained as described above. If the e eem to be no necessity of draining, the right gutter the peritoneum is closed and a small drain inserted down to it. The remainder of the wound is closed very loosely with interrupted plain catgut sutures. If a drain is inserted into the peritoneal cavity the parietal peritoneum is closed about the drain and the remainder of the wound is left wide open with a clean exposure. We have been accustomed to insert two cigarette drains. We believe that cigarette drains are preferable to tubes for the reason that the tubes are more rigid and are more prone to create necrosis with the liability of a formation of a fecal fistula.

We recognize that after twenty-four hours very little drainage occurs through a cigarette drain. Therefore at the end of twenty-four hours the first cigarette drain is removed with the idea that drainage will occur in the retroperitoneum between the remaining drains. If drainage is poor at the end of a fourth day twenty-four to forty-eight hours the second drain is removed and a small soft rubber tube immediately inserted in its stead. This tube is shortened daily until it finally remains.

While the patient is still under the anesthetic a Leven tube is inserted through the naris into the stomach fifteen centimeters to the side of the esophagus with a piece of alcohol.

Postoperative Care.—The patient is immediately given hypodermoclysis or transfusion if his condition appears to warrant such a procedure. He is returned to the ward and placed in a high Fowler position with instructions that he be given 3 ounces of tap-water every two hours by rectum only. Murphy's drip is used to encourage him to tolerate it. The Leven tube is attached to a bottle and he is encouraged to drink water. If the water does not immediately return through the tube a syringe is employed and water is forced through and the kink is broken.

in order to ascertain that there is no obstruction This procedure should be repeated as small flakes of mucus or other material may occlude the tube If the patient vomits while the tube is in situ it is prima facie evidence that it is occluded

Morphin is administered frequently during the first forty eight hours in order to obliterate pain and diminish peristalsis Should distention occur colon irrigations with the two tubes a small inlet and large outlet are frequently given associated with infusion hypodermically if this is thought advisable

We believe that jejunostomy should be performed early in cases where there seems to be a definite paralytic or mechanical ileus





CLINIC OF DRS C F TENNEY F W BANCROFT AND  
LEWIS GREGORY COLE

FIFTH AVENUE HOSPITAL

GASTRIC ULCER PYLORECTOMY POLYA ANASTOMOSIS

DR C F TENNEY Miss F C white aged sixty six height 135 cm weight 54.8 k was admitted to this hospital on August 30 1936 for observation and diagnosis

The patient is lying comfortably in bed and presents a picture of a person much younger than her years. Her hair is bobbed her face is round and full with many wrinkles particularly about the eyes which give her rather a jolly smiling expression. Her color is pale and sallow her hands are fat with stubby fingers the body shows the skin to be free from any rash or eruption. There is a thick layer of adipose tissue. In conversation she presents the picture of a moron type.

She came to the hospital with a chief complaint of frequent attacks of indigestion. Her family history is negative. There is no history of tuberculosis diabetes or chronic heart or respiratory disease. She had the usual diseases of childhood but none was severe in character. She menstruated at sixteen years of age was always regular ceasing at about forty.

For years she has had attacks of indigestion with occasional vomiting. The attacks have increased in severity in the past two years until at present according to her statement everything she eats is followed by nausea and occasional vomiting. On two occasions a year ago she was slightly jaundiced for a short period of time. The jaundice cleared up without any special treatment except diet. She presents a picture as I have described above of a short stout adult female.

The pupils react equally to light and accommodation the sclera and conjunctiva are normal. Both upper and lower teeth

are false. The throat and mucous membranes of the mouth are normal. No palpable enlargement of the thyroid gland. Her thorax is well developed her respiratory movements are equal and normal in depth. There is no increased dullness and the lungs show no rales. Friction rubs. The apex beat of her heart is in the nipple line and there is no enlargement. There are no murmurs or thrill and no friction rubs.

The abdomen is above the level of the umbilicus pendulous and flabby with slight tenderness on pressure in the epigastrium. There is no rigidity. No masses can be felt there are no scars and no herniae. Her extensor muscles are short and obese her reflexes are present and cutaneous throughout.

The laboratory tests give us a basal metabolic rate of 18.53 per cent below normal. The urine examination is: Acid reaction specific gravity 1.035 albumin crystals faint trace sugar and casts negative a few leukocytes and few uric acid crystals.

The blood count shows Hemoglobin 92 per cent red blood cells 4,000,000 white blood cells 6,000 polymorphonuclears 66 per cent lymphocytes 30 per cent transitional 4 per cent morphology of the blood cells normal.

The blood chemistry shows urea nitrogen 17.5 per cent uric acid 2 per cent blood sugar 0.91. Her blood Wassermann reaction is negative in both antitoxins. Her day chloride is 3.4 mEq 4.3 total 9.7. Her phenolphthalein alkalinity is 5 per cent in two hours her Mosenthal index is 1.01 in specific gravity of 1.010 to 1.026.

X-ray examination of the gastrointestinal tract is given and the film was taken immediately and then an hour after ingestion showing the following findings.

The stomach type is orthotonic peristalsis the velocity equal on the greater and lesser curvature except at the extreme pyloric end of the stomach. Pyloric reflexes are present or contract in the normal manner and the pylorus is definitely contracted. The capsule is symmetric in at least on film and is apparently normal in size. At three hours the stomach is both half empty and the head of the column is in the transverse colon. The

evidence of a shadow which corresponds in size and shape to an enlarged or dilated gall bladder. Films made of the gall bladder after the administration of the dye confirm this shadow as being the gall bladder but no stones could be detected.

The x ray diagnosis then from a study of the films is a positive organic lesion involving the extreme pyloric end of the stomach. This has some of the characteristics of malignancy but it varies sufficiently in size and shape so that one is not justified in making a positive diagnosis of malignancy. There is no doubt however that there is an organic lesion present probably adhesions involving this portion of the tract. There is no pyloric stenosis no functional retention and no ileac stasis.

On the evidence presented by the finding of this patient it was deemed advisable to recommend cholecystectomy for a probably enlarged and diseased gall bladder and a separation of the adhesions about the pyloric end of the stomach seeing if this would not result in a cure of the patient.

Accordingly on September 13 1926 the patient was operated and a cholecystectomy was performed with the surgical diagnosis of chronic cholecystitis appearing on the operative sheet. No other operative findings were recorded.

The pathologic diagnosis was chronic cholecystitis. The macroscopic appearance was a gall bladder 7 cm long by 3 cm in diameter at the fundus. The specimen contained viscid bile. There were no gall stones and sections taken of the fundus and cystic duct showed the gall bladder thick and edematous with conversion of the vessel at the cystic duct end.

The patient made an uneventful convalescence and was discharged from the hospital cured on October 4 1926. She was heard from frequently by letter as she traveled about the United States considerably between the date of her discharge and October 11 1927 when she again appeared at the hospital complaining of gastric distress.

Her letters contained frequent references to her discomfort after eating but the final condition which brought her back to the hospital was the examination of a doctor on the outside

who told her that he probably had gall stones and that her gall bladder had probably not been removed at operation. So she came back to find out.

At this time her examination was much the same as the former except it was quite evident that she had a marked secondary anemia with hemoglobin of 68 per cent red blood cell 3 100 000. Her icterus index was 3. On examination of the gastric contents a low HCl content was found but marked blood was present. Blood was also found in the vomitus at a later date and occult blood was also found in the stool.

Again an x ray film was taken of the stomach immediately and six hours after the ingestion of a barium meal which showed that there was certainly a deformity involving the pyloric canal. This deformity might be gonostasis the weight of evidence was against it being malignant. It was believed that this was an organic lesion however probably a small ulcer on the posterior surface of the pyloric canal proximal to the sphincter. There was no evidence of postpyloric ulcer and the stomach began to empty itself normally. There was however definite hypersecretion.

This condition was explained to the patient and she very readily consented to have a second operation. It was deemed advisable to do a blood transfusion just prior to operation. This was done October 26 1927 and she was ready for the operation to be performed this morning by Dr Bancroft.

Dr F W BANCROFT. In a patient of this type a woman of sixty six years a weakened condition due to her secondary anemia and prolonged illness the anesthesia is a factor that must be considered. First the preoperative preparation is of the type of anesthetic to be used and third the use of ether and possible to hasten the operation and the use of shock. I believe in case of this kind it is important.

Doctor Tenney has carefully prepared the patient for operation and Dr Cole who has made a full study of her x ray picture and is showing the extent of involvement of the stomach and pylorus the x ray film.

going to start transfusing this patient as soon as the operation is finished

She has been carefully digitalized and has been lavaged as a preoperative preparation. We expect considerable difficulty in the region of the duodenum on account of her previous cholecystectomy. We feel that where so much manipulation may be necessary to free adhesion that paravertebral and muscle block will be insufficient. On the other hand obviously this patient cannot stand a prolonged anesthetizing under ether. We have therefore compromised by giving her ethylene

I shall make an incision in the median line retracting the rectus muscle to the right. This will not cut any of the nerves supplying the rectus muscle and should give her a firmer abdominal wall.

As you see there are dense adhesion pulling the duodenum upward which can now be separated slowly by blunt dissection. As we gradually bring the stomach and duodenum upward what seems to be a firm ulcer is felt about 1 cm. proximal to the pylorus. There is considerable thickening of the gastrohepatic omentum in this region. There are no enlarged nodes palpable and as far as we can tell clinically there is no evidence of carcinoma. The problem now arises as to what type of surgical procedure we shall attempt in this particular individual.

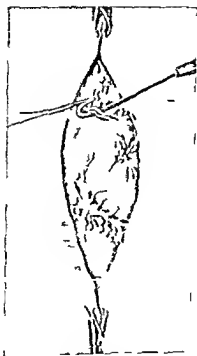
I am convinced that no definite single operation can be prescribed for all cases of gastric ulcer. We must have in our armamentarium several operations. The one to be chosen must be the one that seems advisable for the particular patient.

In this case we have a woman of sixty-six who has had continuous bleeding from an ulcer which may be beginning to have a carcinomatous change. Gastroenterotomy would seem contraindicated as we would be doing nothing to prevent the recurrence or continuance of bleeding. We must therefore excise the pyloric end of the stomach and do a Polya anastomosis.

There are two ways of attacking this problem. The first the type advocated by Berg is to begin on the lesser curvature at the proximal end of our proposed excision place clamps

on the stomach and beginning the resection in this area by the retracted portion to the right expose the duodenum and then excise the entire antrum.

The other method advised by Moynihan is to begin the resection at the duodenum and resect the pyloric end of the



F 311—Part of the stomach and duodenum, showing the pyloric end and the duodenum. (Moynihan)

stomach to the left with toward the duodenum to place clamps on the proximal end and start the anastomosis with the jejunum below the pyloric antrum has been done. The second method is to make a diagonal incision in the greater curvature for the following reason: first, it begins at the pyloric end and extends a considerable distance toward the stomach.

has been cut. Second if one starts as in the first method it is necessary at that time to place a clamp across the proximal end of the stomach. This clamp has to remain in situ until the resection is completed. If one runs into difficulty it may mean that the clamp remains on the stomach for a considerable

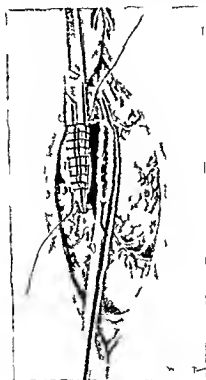


Fig. 1 - Cl. (M. J. h. Abd. m. l. Ope. l. ) (Ib. g. lly. l. ft. t. l. t. t. g. )

period of time. This seems unphysiologic. Obviously if we could do all gastric resections without the use of clamps our results would be better. To constrict the circulation for an hour or more in the region in which our anastomosis is to be applied is producing a severe insult on tissue.

I shall therefore start with the Moynihan type. I am



glad Dr Cole is present as I am going to ask him to tell me when I have gone beyond the involved area of the stomach I believe he is in a better position from his study of the x ray film to tell me than I am able to decide by simple palpation of the stomach



Fig 313—Duodenum closed Right gastroepiploic artery ligated (Mention Abdominal Opening)

I have now freed the terminal duodenum and am applying a Pyloric clamp. I now cut through the distal to the pylorus and I shall close the stump of the duodenum with sterile forceps and continue the resection of the stomach. After the pyloric antrum has been excised it will give me better exposure to the duodenal stump. The present procedure

is relatively simple and consists in ligating the gastrohepatic and gastrocolic omentum close to the stomach (Figs 311-313)

As I have dissected back beyond where I think the ulcer extend I shall ask Dr Cole if he feel that this is sufficient excision Dr Cole tell me that he thinks I should go at least

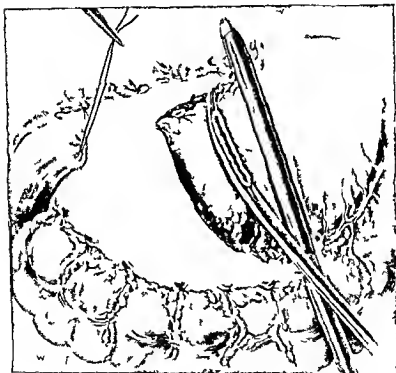


Fig. 314—Stomach after dissection of pylorus (May 1901) (Abdominal Operation)

1 cm further at the x-ray how limited peristalsis in this region. As I have now completed the area of our extension I shall put a long Payre clamp across the pyloric antrum and a soft rubber clamp to prevent soiling when we do our excision (Fig 314)

The best method of anastomosis that we know in a case of this kind is to bring the jejunum up through the mesocolon

and anastomose to the stomach above the mesocolon. I have perforated the mesocolon in an avascular zone and am bringing through the jejunum. I will leave a loop of about 4 inches from the fœta of Treitz (Fig. 315).

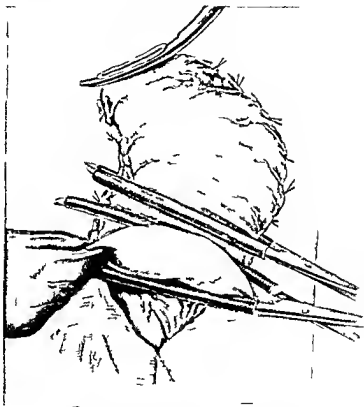


Fig. 315.—Clamp placed distally in the mesocolon by the jejunum. The stomach is held in position by the clamp. (Myh. Allm. Ope.)

With continuous chromic thread I do the first part of the anastomosis. After the completed I all use the jejunum just proximal to the lig. Pyloric clamp. The remaining part of the anastomosis is completed by the jejunum.

enterotomy or stomach resection care being taken to ligate separately all bleeding points and suture the mucosa carefully. The suture material used is No 00 chromic (Figs 316-317).

Having now completed our anastomosis we turn in the duodenal stump with two inverting liver and reinforce it by

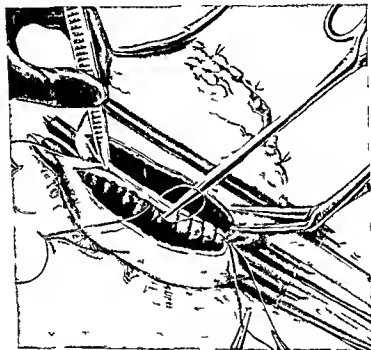


Fig 316—F t t m p l t d g t t t m y Th t m  
ch d j j m h be pe d d th th gh d th gh  
t b g p p l d Th t m a h g lly t y p l t l y b t  
wh th m h t po t th m th d l l t t d m y be f llo w d  
th j g (M y h Abd l Ope t )

suturing the omentum over the stump. The next procedure is to bring the stoma and our anastomosis entirely through the mesocolon so that the anastomosis and about 1 inch of the stomach lie below it. This procedure is important because when edema occurs in the mesocolon it will tend toward con-

and anastomose to the stomach above the mesocolon. I have perforated the mesocolon in an avascular zone and am bringing through the jejunum. I will leave a loop of about 4 inches from the fosa of Treitz (Fig. 315).

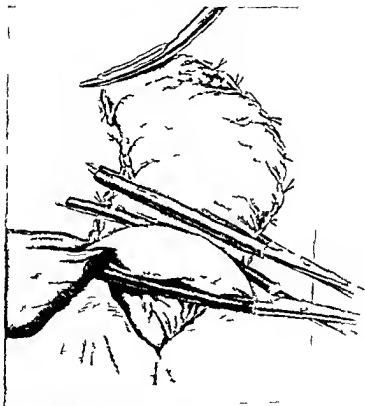


Fig. 315—Clamp applied to the jejunum distended by distal loop of jejunum brought through the mesocolon (Mynah's Abdominal Operation).

With a continuous chromic stitch I do the first post layer. After this is completed I will secure the jejunum just proximal to the large P-r clamp. The main part of the anastomosis will be a minor mirror image.

insert through her nose a Levin tube which is a type of duodenal tube. It will be left in situ for twenty four to forty eight hours allowing egress of gas. We will permit the patient to drink water knowing that it will be syphoned back immediately. We feel the insertion of such a tube is a marked safeguard as it prevents vomiting, as well as gas distention.



Fig 318 — R y f d g h t m t S p t m b 1 1926

Postoperative Notes—The patient had an uninterrupted convalescence. The Levin tube was removed at the end of forty eight hours. She vomited once postoperatively. As a means of postoperative therapy she was given frequent small tap water retention enemata and hypodermoclysis. Her wound healed per primam and she left the hospital in satisfactory condition on November 19th.

Her recent follow up letter says she has regained her lost weight, has no indigestion and feels perfectly well.

striction. If we should allow the anastomosis to lie above the mesocolon it would constrict the proximal and distal portions of the jejunal loop with danger of obstruction and an enterostomy would be necessary.

The mesocolon is sutured with interrupted suture and our procedure is complete. The time required has been one hour.

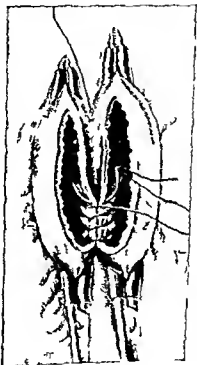


Fig 317 The same

1. Operation

(M. J. H. M. J.)

and fifty five minutes. This is a longer time than perhaps should have been used but the freeing of the adhesions due to the previous operation proved to be the procedure. The patient is in fair shape but is still immovably transfused with about 500 cc of blood by the Ugrmth. I wish also

contour of the stomach close to the pyloric sphincter again prevented me from making a positive diagnosis of malignancy and in addition to this the process had not extended during the interval since previous examination and operation.

Actual size reproductions of photographs of the removed specimen were made. One (Fig 320 A) shows the outside of the stomach and another (Fig 320 B) the inside of the stomach after it had been prepared in a special manner to prevent distortion. A correlation of the x ray findings with the pathologic specimen definitely illustrates the type pathology and the reason the x ray findings were not characteristic either of ulcer or of cancer.

An enlarged photograph (Fig 321) of the region of the lesser curvature including both ulcers and part of the distorted flap of mucosa shows the detailed structure of the coats of the stomach and the relation of the ulcer to these various coats.

There were two ulcers (UA and UB Fig 321) one about  $1\frac{1}{2}$  cm in diameter involving all coats of the stomach. Beneath the base of each of these ulcers and walling it off from the peritoneum was a thick peritoneal patch of connective tissue within which were observed two large blood vessels. Between the two ulcers was a bridge of mucosa (MB Fig 321) supported by a small stalk of connective tissue resembling an inverted toad tool. The cicatricial contraction of the connective tissue associated with the healing or attempted healing of this ulcer drew the mucosa (DM Fig 321) of the greater curvature into the lumen of the stomach. A large flap of distorted mucosa on the lesser curvature just distal to the crater on the large ulcer caused an encroachment upon the lumen of the stomach not usually observed in simple ulcers. It was this hyperdevelopment of the mucosa only to be differentiated from carcinoma by microscopic examination which originally from the x ray examinations led to the difficulty in differentiating between cancer and ulcer in this particular case.

There was an area (NM Fig 321) about 2 cm long distal to this distorted flap and proximal to the sphincter where the



The accompanying photographs show the pathology and Dr Cole will describe it as shown in the specimen removed with relation to the x ray interpretation

DR LEWIS GREGORY COLE The radiographic findings at both the first and second examinations were characteristic of either carcinoma or gastric ulcer The findings were very



Fig 319—x Ray findings described the first second  
Oct 1 11 192

constant though the full range of film made the erect and prone position and in the oblique position

At the first examination I was somewhat doubtful the process being an early antral carcinoma but there was just enough variation in the films to permit me from making the diagnosis positively

At the second examination about year later the findings were precisely the same findings were observed The changes in

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Actual size reproductions of photographs of the removed specimen were made. One (Fig 320 *A*) shows the outside of the stomach and another (Fig 320 *B*) the inside of the stomach after it had been prepared in a special manner to prevent distortion. A correlation of the x ray findings with the pathologic specimen definitely illustrates the type pathology and the reason the x ray findings were not characteristic either of ulcer or of cancer.

An enlarged photograph (Fig 321) of the region of the lesser curvature including both ulcer and part of the distorted flap of mucosa shows the detailed structure of the coats of the stomach and the relation of the ulcer to the various coats.

There were two ulcers (*UA* and *UB* Fig 321) one about 1 cm in diameter in outer wall coat of the stomach. Beneath the base of each of these ulcers and walling it off from the peritoneum was a thick peritoneal patch of connective tissue within which were observed two large blood vessels. Between the two ulcers was a bridge of mucosa (*MB* Fig 321) supported by a small stalk of connective tissue resembling an inverted toad tool. The cicatricial contraction of the connective tissue associated with the healing or attempted healing of this ulcer drew the mucosa (*DM* Fig 321) of the greater curvature into the lumen of the stomach. A large flap of distorted mucosa on the lesser curvature just distal to the crater on the large ulcer caused an encroachment upon the lumen of the stomach not usually observed in simple ulcers. It was this hyperdevelopment of the mucosa only to be differentiated from carcinoma by microscopic examination which originally from the x ray examinations led to the difficulty in differentiating between cancer and ulcer in this particular case.

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Fig. 319—x R y findings described the  
October 11 19

constant throughout the film series of film in the erect and prone position and in the barium meal.

At the first examination I was much more in favor of the process being an early adenocarcinoma but there was just enough irritation in the film to prevent me from making this diagnosis positively.

At the second examination about a year later in the precisely the same findings were observed. The findings

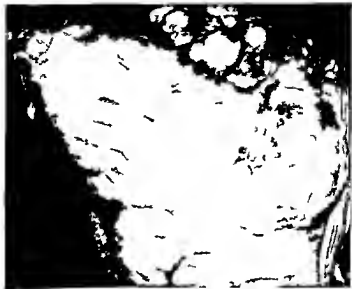
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There was an area (*VM* Fig 321) about 2 cm long distal to this distorted flap and proximal to the sphincter where the



A



B

Fig 320

phability in the gastric wall indicated it was not malignant. A very small ulcer just proximal to a large one is really of more pathologic interest than is the large ulcer in itself. The relation of this small ulcer to the coat of the stomach is also of significance as indicating a submucosal type of ulcer. Owing to the density of the print the relation of this crater to the muscular coat is shown more distinctly in Fig. 320 B. The deform

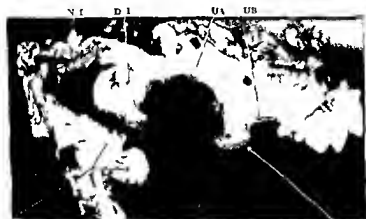


Fig 31—El g d ph t g pl f th g of th l cu t  
l d g b th l d p t f th d t t d fl p f m U A La ge  
f U B sm ll l D M d t r t d m M B m c b dg A M  
m l m a

ity in the x ray caused by the crater of each of the e ulcers can be definitely identified when one compares the pathologic specimen with the x ray. It can be seen that the small ulcer has developed since the original examination.

Microscopic examination proved that the distorted flap which somewhat resembled malignancy was not malignant.

Fig 320—Th gul d l d l p m t th t p f A l g  
h l se t f th t m h po d with th t t s t  
th b se f th f g d m ll l It t be t d th t A d B tch  
h th ly Th t f th t d d th d f th t m h  
gr ph cally h w th t figu nd th p b t th m th t  
th ga t w ll d p th l gy h w Fg 31



## CLINIC OF DR LEWIS GREGORY COLE

### FIFTH AVENUE HOSPITAL

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## THE STATUS OF ROENTGENOLOGY IN GASTRO ENTEROLOGY

By roentgenology the author refers to serial roentgenography. By gastroenterology is meant all aspects of this subject—etiology pathology pathogenesis the life history of the disease symptomatology diagnosis prognosis indications for medical or surgical treatment the results of both and the relative value of each. That roentgenology in one form or another—fluorography single films or serial roentgenography—is an adjunct in gastrointestinal diagnosis is finally established. That this has been accomplished in a decade and a half is quite remarkable. The exact date is well established. A representative of a large clinic (acting under instructions as he subsequently told me) attended the annual meeting of the Mississippi Valley Medical Association in the fall of 1912 and said in discussing the subject of x-ray diagnosis in organic gastric lesions x-ray is good for bone chest and kidneys but it is of no value in the diagnosis of gastrointestinal lesions.

Roentgenology having been established as an adjunct in the diagnosis much controversy even among roentgenologists ensued as to whether it should be applied to anything except diagnosis and the time is not far past since it was the opinion of many that the x-ray should be employed only to give the finding and not the diagnosis. In other words it was thought by some that the roentgenologist should say that there is a filling defect of some part of the stomach but should not interpret that finding of the filling defect into terms of pathology that is he should not make a diagnosis of cancer ulcer or some other organic lesion nor should he differentiate filling defects due to spasm from those due to cancer. My belief is that any



method that is valuable for the relief of suffering humanity should be used to its utmost.

Only a limited number of roentgenologists have time or inclination to use the interpretation of roentgenologic findings in the fundamental branches of medicine such as anatomy, physiology, etiology, the study of pathology and pathogenesis. They feel that it is their business to use it as an adjunct in the diagnosis but they have no time or inclination to follow the case further unless it be for a fee and no wish to assume any further responsibility for the surgical procedure or the results of such procedure. All of these are none of their business—they say.

This is an easy way to travel through one roentgenologic career in the deep rut that has been made by the earlier workers. Yet if the patient were in your own family and the diagnosis of gastric ulcer had been established practically solely on the x-ray finding would you be satisfied to accept the diagnosis of gastric ulcer without any qualification and use it solely as a diagnosis? Could you wish to know the size, shape and depth of the crater here it is located, whether the cardia or the pylorus whether it is surrounded by a large area of induration which projects into the lumen of the stomach or whether it is practically free from induration whether it is beneath the mucosa and possibly the submucosa or whether it has burrowed into an adjacent viscus (pancreas or liver) or whether it has been dislocated by peritoneal adhesions in the lesser peritoneal sac or between the lesser curvature of the greater peritoneum or if it has stripped its way between the coats of the stomach and caused pyloric obstruction. If you wish to know these facts then I would wish to know them. Not simply as a refinement of life but because you are going to use them to determine the prognosis and treatment so that you know whether it should be medical or surgical and if surgical procedure is to be employed you will at last you should use that evidence to determine what type of operation should be performed and you may use it to prognosticate the eventual degree of certainty of the success of the operation. Therefore when the

will or will not *admit* that you use a ray evidence for more than diagnosis as a matter of fact if the patient is yourself or in your own family *you do use that evidence* for more than diagnosis.

Whether you as a general practitioner or surgeon assume the responsibility of interpreting these a ray finding into terms of prognosis and indications for medical or surgical treatment or whether the responsibility is assumed by the roentgenologist is a matter that is not of vital importance. But this responsibility should be assumed by that person who interprets the x ray findings the so called filling defect into terms of pathology—gastric ulcer or some particular type of gastric ulcer. If that responsibility is taken by the roentgenologist then he must likewise assume part of the responsibility whether he wants to or not for deciding the more serious problem of prognosis and indications for treatment. If the general practitioner gastroenterologist or surgeon interprets the findings that is the filling defect into terms of pathology then *he* must assume the responsibility for further use of these findings in prognosis and indications for medical or surgical treatment.

For a time the question of whether roentgenology should be a specialty or simply one of the many laboratory methods of diagnosis hung in the balance. But it has now become a highly organized specialty in every sense of the word. To a very large extent the doctors who practice roentgenology practice it as a specialty to the exclusion of other branches. For more than twenty five years there have been organized national roentgenologic societies and more recently international societies have been formed. The influence of these on the practice of medicine in the last decade has exceeded that of any other specialty.

It is perfectly true that the great majority of early workers including myself had no previous training that would have prepared them for such an important position in medicine. Neither had they *anyone to train them in the making or interpretation of roentgenograms*. Indeed some of the most eminent of the early workers were not even physicians when they first took up the work.

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Only a limited number of roentgenologists have time or inclination to use the interpretation of roentgenologic findings in the fundamental branches of medicine such as anatomy, physiology, etiology, the study of pathology and pathogenesis. They feel that it is their business to use it as an adjunct in the diagnosis, but they have no time or inclination to follow the case further unless it be for a fee and no wish to assume any further responsibility for the surgical procedure or the results of such procedure. All of these are none of their business—they say.

This is an excuse to travel through one's roentgenologic career in the deep rut that has been made by the early workers. Yet if the patient were in your own family and the diagnosis of gastric ulcer had been established practically solely on the x-ray findings, would you be satisfied to accept the diagnosis of gastric ulcer without qualification and use it as a basis for diagnosis? Or would you wish to know the shape and depth of the crater where it is located, whether near the cardiac or the pyloric whether it is surrounded by a large area of induration which projects up to the lumen of the stomach or whether it is practically free from induration whether it involves the mucosa and possibly the submucosa or whether it has burrowed into an adjacent viscous (pericolic or other) whether it has been wall'd off by peritoneal adhesions in the lesser peritoneal sac or between the layers of the greater peritoneum or if it has stopped its way between the coats of the stomach and caused pyloric obstruction. If you wish to know these facts why do you wish to know them? Not simply as a refinement of diagnosis but because you are going to use them to determine the prognosis and indications for treatment whether it should be medical or surgical and if surgical procedure is to be employed you will at least you should use that evidence to determine what type of operation should be performed and you may use it to justify the operation with a reasonable degree of certainty that success of the operation. The effort which you

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With the rapid development of roentgenology during its first and second decade it became apparent that the scope and accuracy of this method of diagnosis formed the very foundation on which gastro-enterology was to be built or at least reconstructed. Gastro-enterologists were divided into two camps — those who kicked against the pricks and said that the x-ray method were of no value and those who purchased some type of x-ray apparatus and either kept it unused as an ornament of the office to impress their patients or else attempted to use it and without training in the specialty posed as gastro-intestinal roentgenologists.

A glaring example of this latter was a gastro-enterologist who purchased an x-ray apparatus and prior to the time it was installed published a laboratory article on the value of fluoroscopic examination of the gastro-intestinal tract. The data for this which had been cribbed from the works of experienced roentgenologists had been largely derived from roentgenographic work and was therefore erroneously applied to fluoroscopy. In spite of this the man in question retained his chair of gastro-enterology in a well known medical school and since the day his equipment was installed he enjoyed a reputation as a gastro-intestinal roentgenologist.

I ask, could this have occurred in any other specialty? Could a man without training have bought ugly instruments and successfully posed as a surgeon? Could he have bought an ophthalmoscope and become an oculist? This is a example of practice that is fully dependent on intuition and a man's attitude to public safety. Let it redress the accuracy and competence of roentgenology. If we then let it know the competent from the incompetent.

There has indeed been some use for the university in connection with the faculties of both undergraduate and postgraduate medical schools and is notably negligent in that they have failed to offer opportunity for adequate training to those who desire it. The lack of any possibility of adequate roentgenologic training in medical school equally affects the students who wish to practice other specialties and it is an

roentgenology as it applies to their specialties as well as those who wish to practice roentgenology itself as a specialty and to learn the essentials of other fundamental branches of medicine. The only manner in which a student can now obtain training in roentgenology either as a roentgenologist or as some other specialist is to associate himself with some roentgenologist and absorb what he can as the medical student of old absorbed his knowledge from his preceptor. It may be that the roentgenologist turned out as it were by hand or in the old fashioned method would prove to be individually far superior to those trained by some more up to date man but as conditions are now the *quantity* production of roentgenologists (however high their *quality*) is insufficient for the demand.

If value is to be derived from the interpretation of roentgenograms in gastro intestinal lesions and general medicine and surgery certainly some effort must be made to train men in this line of work. (You will please note that I do not say to train roentgenologists.) To this end there are two courses of procedure that may be followed. According to one *medical students clinicians surgeons and general practitioners* must be so adequately trained that without the aid of a specialist they can interpret the x ray finding in terms of pathology etiology prognosis indications for treatment and last but not least that they may apply the acid test of following up the case by subsequent roentgenographic examinations to know whether the treatment—medical or surgical—has been of value in bringing about the disappearance of the pathologic process. The second course that may be followed requires that the doctor who detects and interprets the finding be adequately trained in the fundamentals of anatomy physiology and pathology before he can interpret the finding in terms of physiology and pathology. By adequately I mean that the training must be in excess of that acquired by the medical student in his ordinary pursuit of knowledge and that he must furthermore be trained in the making and interpreting of roentgenograms.

The value of repeated x ray examinations is not thoroughly appreciated. The general practitioner sees a case time and

With the rapid development of roentgenology during its first and second decade it became apparent that the scope and accuracy of this method of diagnosis formed the very foundation on which gastroenterology was to be built or at least reconstructed. Gastroenterologists were divided into two camps—those who kicked against the pricks and said that the x-ray method were of no value and those who purchased some type of x-ray apparatus and either kept it unused as an ornament of the office to impress their patients or else attempted to use it and without training in this specialty posed as gastro-intestinal roentgenologists.

A glaring example of this latter was a gastroenterologist who purchased an x-ray apparatus and prior to the time it was installed published an elaborate article on the value of fluoroscopic examination of the gastro-intestinal tract. The data for this which had been cribbed from the works of experienced roentgenologists had been largely derived from roentgenographic work and was therefore erroneously applied to fluoroscopy. In spite of this the man in question retained his chair of gastroenterology in a well known medical school and since this day his equipment was installed has enjoyed reputation as a gastro-intestinal roentgenologist.

I ask could this have occurred in any other specialty? Could a man with this training have bought a gelatin instrument and successfully posed as a surgeon? Could he have bought an ophthalmoscope and become an oculist? This is an example of practice that is full of peril and is a menace to public safety and credit on the accuracy and scope of roentgenology. He is then entitled to know that competent firms have the incentive.

The case has indeed been many times of this unfortunate condition since the facilities of both undergraduate and postgraduate medical schools are not only negligent in that they have failed to offer opportunities for adequate x-ray training to those who desire it. The lack of any possibility of adequate roentgenologic training in medical schools equally affects the students who wish to practice other specialties and to learn

in situ. By so doing he acquires actual personal knowledge as to the success or failure of surgical procedure in specific cases where the indication for surgical procedure have been largely based on the x ray findings especially those which he previously interpreted into terms of pathology. This was done in the case of the report in this issue by Dr Bancroft.

To be of greatest value however the roentgenologist must subsequently follow up these cases. It is not enough for him to obtain a clinical history from a doctor or someone else concerning relief from the symptoms but he must ascertain the results of the surgical procedure or the course of medical treatment as the case may be by *actual roentgenographic study and personal inquiry*. This we have referred to as the acid test and should be applied alike to both surgical and medical treatment and it is by no means limited to cases of gastric ulcers or duodenal ulcers or even to gastro intestinal lesions but is equally applicable to general medicine and surgery and many of their special branches.

It is of course absolutely essential that such roentgenologic study should be carried on in hearty cooperation with the surgeon or physician in charge who after all is fundamentally responsible for the case.

Wherever possible the pathologic specimen should be thoroughly studied by the roentgenologist who together with the pathologist should prepare it so that the roentgenologist can subsequently compare the morphologic changes in the wall of the gut with the x ray findings on which he based his diagnosis. In the case of a discrepancy between these x ray findings and the morphologic changes in the wall of the gut I personally feel that the diagnosis was erroneous. An example of this correlation of very difficult roentgenologic findings with the pathologic specimen in the roentgenograms and illustrations of a pathologic specimen may be seen in the case reported by Dr Bancroft previously referred to in the present issue of THE SURGICAL CLINICS OF NORTH AMERICA.



time again making physical examinations and taking clinical histories as often as is necessary and following the case over a considerable period of time. If the case fails to progress satisfactorily a specialist will be consulted—maybe a clinician, surgeon, aurist, oculist, cardiologist or roentgenologist. The specialist is expected to express an opinion, often to make the vital decision as to whether surgical procedure is or is not indicated—and all too often after only a single examination! Speaking solely as a roentgenologic specialist I cannot too strongly urge that when there is doubt either as to the diagnosis or as to the indication for surgical or medical treatment the decision should not be rendered immediately, but subsequent examination or examinations should be made within a relatively short time to determine the progress or retrogression of the pathologic process. Such a procedure will readily enable the specialist to give a correct opinion whereas a single examination might have led to an incorrect conclusion, especially concerning the indication for treatment.

Very often roentgenologists are requested to send a report on some x-ray examination which was made months or even years previously in order to avoid having another x-ray examination and the old report is frequently used to indicate the present condition of the patient. It would be just as reasonable to ask for a physical examination—a urine analysis which was made for the patient five or four years previously to indicate his present condition. This, of course, will be absolutely absurd except for the purpose of comparing the old report with the recent examination to note the progress or improvement in the pathologic condition.

After the roentgenologist travels in the rapidly changing in the practice of roentgenology—that is the interpretation of x-ray findings in terms of pathology—his judgment is further greatly enhanced by the wisdom he may acquire by observation of his errors at the operating table and at the autopsy table. He may also bring greater confidence in the accuracy of his diagnosis by being present at the operation and preferably in the operating room that he can actually see and if possible feel the pathology.

CLINIC OF DRs F W BANCROFT AND D S D JESSUP

FIFTH AVENUE HOSPITAL

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### HEMORRHAGIC CYST OF THE SPLEEN

HEMORRHAGIC cysts of the spleen are of sufficient rarity to justify a report of this case. It is also worthy of note that an abdominal surgeon must of necessity be so situated that he may meet any emergency after entering the peritoneal cavity.

In this case an error in preliminary diagnosis was made. It was thought that the tumor was a fibroid of the uterus and it was not until the peritoneal cavity was opened that the diagnosis was made. It was then necessary to perform an immediate splenectomy without previous consideration of this procedure.

Mrs S. P., aged thirty-seven, admitted to the Surgical Service of the Fifth Avenue Hospital November 26, 1921, complained of a tumor in the abdomen and menorrhagia with secondary weakness.

I saw this patient for the first time in September, 1925, at which time she complained of a tumor in the abdomen. She had then three children living and well. She stated that her menstrual period came every three weeks at which time she flowed very profusely. On examination I found a rounded mass about the size of an orange lying midway between the umbilicus and the pubis slightly to the left of the median line. It was freely movable and I felt that it was attached loosely to the fundus. A diagnosis of fibroid was made.

Later in 1926 she consulted another physician who treated her by x-ray therapy. Her period ceased for five months. She then had one period and became pregnant giving birth to a twin in January, 1927.



Blood count Hemoglobin 68 per cent red blood cell 5 000 000 white blood cells 11 000 polymorphonuclears 64 per cent lymphocytes 34 per cent mononuclears 1 per cent eosinophil 1 per cent

The patient was typed and found to belong to Type II. She was matched with a donor with no agglutination of the cells either.

*Operation November 16 1927* (1) *Cauterization of cervix for cervicitis* (2) *appendectomy for chronic appendicitis* (3) *splenectomy for solitary cyst of spleen* (1) *Cauterization of Cervix for Cervicitis*—Lithotomy position. Cervix showed marked erosion and bilateral laceration. As a hysterectomy was contemplated it was thought advisable to puncture the cysts with a cautery and produce linear cauterization to reduce the cervicitis. This was done.

(2) *Appendectomy for Chronic Appendicitis and* (3) *Splenectomy for Solitary Cyst of Spleen*—Dorsal position. Left paramedian incision from umbilicus to pubis. On opening the peritoneum without a thorough inspection the appendix was sought and found to be tortuous indurated and retrocecal. It was removed. The uterus was then sought and found to be slightly larger than normal. It did not contain fibroids nor was the mass attached to it. The hand was then inserted beneath the upper portion of the incision and a large cyst about 5 inches in diameter was seen. On pulling it down into the wound it was found to be in the lower portion of the spleen.

The splenic tissue extended over it in all directions. The remainder of the spleen was larger than normal and firm. It was considered impossible to excise the cyst and leave the spleen for fear of secondary hemorrhage. Therefore a splenectomy was decided upon. The wound was extended upward to allow adequate exposure. Adhesions of the upper border of the spleen to the diaphragm were doubly clamped and cut. There were numerous adhesions to the omentum in the neighborhood of the cyst. These were doubly ligated and cut. The pedicle was then clamped and cut in sections between clamps and the spleen removed. Chrome ligatures were applied to the pedicle.

She was admitted to the Fifth Avenue Hospital in November 1921 complaining of the lump in her abdomen and menorrhagia. Since the birth of the twin in January 1927 her period had averaged three weeks and she had been flowing eight to ten days.

**Medical Examination**—A slight individual with clear skin free of any rash or eruption. A systolic murmur was heard over the apex of the heart and therefore a medical consultation was requested. Following is a note made by Dr. Tenney.

Heart sounds clear and distinct on percussion. No enlargement. At the base there is a systolic murmur which becomes more audible on exertion and does not become irregular. The

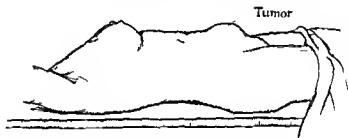


Fig 32—Tumor of the abdomen

rate following exertion increased to 110 per minute. Blood pressure 130/70. The patient is considered a good risk for operation and I do not believe that any preliminary treatment is necessary.

**Abdominal examination** showed a large mass, slightly palpable in the lower abdominal midline between the pubis and umbilicus. The mass was freely movable and was about the size of a grapefruit. It seemed to be elongated and extended more to the left. Its upper border was indistinct.

The pelvic examination revealed Cervix bilobed, lacerated with marked cervicitis. The fundus could not be sharply mapped out and the mass has a fluctuant character but is not continuous with the fundus.

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*Operation November 16, 1921.* (1) *Cauterization of cervix for cervicitis.* (2) *appendectomy for chronic appendicitis.* (3) *splenectomy for solitary cyst of spleen.* (1) *Cauterization of Cervix for Cervicitis.*—Lithotomy position. Cervix showed marked erosion and bilateral laceration. As a hysterectomy was contemplated it was thought advisable to puncture the cysts with a cautery and produce linear cauterization to reduce the cervicitis. This was done.

(2) *Appendectomy for Chronic Appendicitis and (3) Splenectomy for Solitary Cyst of Spleen.*—Dorsal position. Left paramedian incision from umbilicus to pubis. On opening the peritoneum without a thorough inspection the appendix was sought and found to be tortuous, indurated and retrocecal. It was removed. The uterus was then sought and found to be slightly larger than normal. It did not contain fibroids nor was the mass attached to it. The hand was then inserted beneath the upper portion of the incision and a large cyst about 5 inches in diameter was seen. On pulling it down into the wound it was found to be in the lower portion of the spleen.

The splenic tissue extended over it in all directions. The remainder of the spleen was larger than normal and firm. It was considered impossible to excise the cyst and leave the spleen to fear of secondary hemorrhage. Therefore a splenectomy was decided upon. The wound was extended upward to allow adequate exposure. Adhesions of the upper border of the spleen to the diaphragm were doubly clamped and cut. There were numerous adhesions to the omentum in the neighborhood of the cyst. These were doubly ligated and cut. The pedicle was then clamped and cut in sections between clamp and the spleen removed. Chronic ligatures were applied to the pedicle.

She was admitted to the Fifth Avenue Hospital in December 1921 complaining of the lump in her abdomen and menorrhagia. Since the birth of her twins in January 1927 she had averaged three weeks and she had been menstruating for ten days.

**Medical Examination**—A light individual with skin free of any rash or eruption. A systolic murmur was heard over the apex of the heart and therefore a medical consultation was requested. Following is a note made by Dr. Tenney: "Heart sound clear and distinct on percussion. No enlargement. At the base there is a systolic murmur which becomes more audible on exertion and does not become irregular."

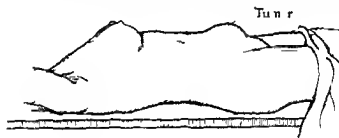


Fig. 32.—Pregnancy type (case)

rate falling on exertion, indicating only slight mitral regurgitation. Blood pressure 130/70. The patient could not hold her breath for more than 10 seconds. I did not believe that a hysterectomy was necessary.

**Abdominal examination**—The large mass was readily palpable in the lower abdomen midway between the pubis and umbilicus. The mass was fairly movable but about the size of a grapefruit. It seemed to be a large, single, rounded mass more to the left. Its upper border was indefinite.

The pelvic examination was difficult. Cervical dilatation was not marked. The fundus could not be sharply mapped out and the mass was high. It was not bony in character. The fundus was not palpable.

Blood count Hemoglobin 68 per cent red blood cell 5 000 000 white blood cells 11 000 polymorphonuclears 64 per cent lymphocytes 34 per cent mononuclears 1 per cent eosinophil 1 per cent

The patient was typed and found to belong to Type II. She was matched with a donor with no agglutination of the cells of either.

*Operation November 16 1927* (1) *Cauterization of cervix for cericitis* (2) *appendectomy for chronic appendicitis* (3) *splenectomy for solitary cyst of spleen* (1) *Cauterization of Cervix for Cericitis*—Lithotomy position. Cervix showed marked erosion and bilateral laceration. As a hysterectomy was contemplated it was thought advisable to puncture the cysts with a cauterizer and produce linear craterization to reduce the cericitis. This was done.

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The splenic tissue extended over it in all directions. The remainder of the spleen was larger than normal and firm. It was considered impossible to excise the cyst and leave the spleen for fear of secondary hemorrhage. Therefore a splenectomy was decided upon. The wound was extended upward to allow adequate exposure. Adhesion of the upper border of the spleen to the diaphragm were doubly clamped and cut. There were numerous adhesions to the omentum in the neighborhood of the cyst. These were doubly ligated and cut. The pedicle was then clamped and cut in sections between clamps and the spleen removed. Chromic ligatures were applied to the pedicle.





3 *Degenerative cysts* (solitary and large) arising from secondary change in infarcted areas due to arterial degeneration or occlusion of blood vessel by emboli with consequent necrosis of the pulp

4 *Dilatation Cysts*—Dilatation of splenic sinus (polycystic disease Coenen Fowler) The cysts are multiple and filled the cysts usually riddle the organ

5 *Neoplastic Types* (*lymphangioma hemangioma*)—It may not be possible to distinguish Group 4 which may be borderline in its tendencies from this group The differential criterion is still obscure

**Etiology**—Cysts of the spleen occur most frequently in women during the child bearing period Trauma seem to bear the most important role In the case reported six seemed to show a definite relation between pregnancy and cyst formation One cannot however rule out the inference of a twisted pedicle embolism of the splenic vessels with resultant infarct and intra splenic disease of the vessel Single large unilocular so called hemorrhagic cysts have been reported and also single unilocular serous cyst It is stated that hemorrhage may occur into serous cysts producing hemorrhagic variety and that late the hemorrhagic variety may develop into a serous cyst by liquefaction of the hemorrhagic contents

In our particular case there were two possible factors in the etiology first a possible endocarditis as evidenced by the systolic murmur In this case it might be assumed that infarction had occurred in the lower splenic vessels with the resultant hemorrhagic cyst The second factor is pregnancy It is interesting to note that she had three pregnancies before first seen and later following x-ray therapy a pregnancy with twins after the first menstruation following the menorrhagia and therefore one might assume that pregnancy was a factor in this case No history of abdominal trauma could be elicited

**Pathology**—Dr D S D J sup—*Hemorrhagic Cyst of Spl* Specimen weighs 620 gm It is 20 cm in length (Fig 3?) The upper portion for a distance of 12 cm shows normal

plenic outline and 1.6 cm in breadth at the hilum with a thickness of 3 cm. The lower pole shows a globular enlargement at



Fig 33—Human spleen

tached to the upper by a pedicle which is 4 x 2 cm. The surface of this enlargement is covered by thickened peritoneum.

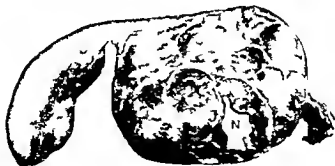


Fig 34—Human spleen

cum which shows are soft adherent to the hilum and to the main body of the spleen (Fig 34) the lower pole is adherent to the upper

show an outer fibrous capsule extending around the whole tumor and at the pedicle sharply differentiating it from the splenic pulp. The cut surface shows a solid dark red growth separated into round or oval cyst-like spaces by bands of firm fibrous tissue. The spaces vary in size from 1 to 4 cm. and are filled with dark red tissue which has the appearance of organizing thrombi or hematomata. At several points there are pale necrotic-looking areas. A large one is shown at A in Fig. 324.



Fig. 325.—Histology of the tumor. High power photomicrograph showing blood vessel and hematoma.

At the edge of the tumor near the pedicle there are some large blood vessels.

*Micropsy Examination*.—Sections of the spleen itself apart from the tumor show ordinary structure but there is narrowing of the arteries of the tuft and thickening of the trabeculae. Section of the tumor shows thick fibrous capsule. Within this some areas show a fibrous stroma with extravasation of red cells and thrombosed blood vessels and other engorged

vessels. Other areas show poorly staining necrotic looking tissue with areas of edema and stellate cells containing pigment. Some areas are composed of a stroma containing many thin walled vessels and giving the appearance of an angioma (Fig 325).

An area in which the blood spaces are closely placed and the blood cells are degenerated is shown in Fig 326. The whole microscopic picture is thus one of a solid encapsulated tumor of the spleen showing large numbers of blood vessels with extravasation of blood and necrosis. It suggests a long standing process with repeated hemorrhages into the growth. In Fowler's

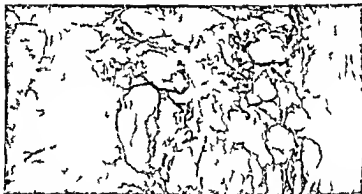


Fig 326—H m b g t f pl L w p ph gr ph f l scl  
p k d bl d sel f d g t

classification of non parasitic cysts of the spleen our tumor appears to fall into his Class 5 neoplastic type which include lymphangioma and hemangioma. There does not appear to be sufficient evidence to place it with his Class 1 traumatic cysts and to call it an encysted hemangioma. In the absence of our knowledge of the mode of origin of this case it is perhaps better to term it merely hemohagic cyst.

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## ADENOMYOMA OF THE RECTOVAGINAL SEPTUM

- (1) SUPRAVAGINAL HYSTERECTOMY FOR MULTIPLE FIBROIDS
- (2) RESECTION OF RECTOSIGMOID WITH END TO END ANASTOMOSIS FOR OBSTRUCTION DUE TO ADENOMYOMA.

The patient Mrs S aged thirty eight is presented because this lesion is usually mistaken for malignancy of the rectum and usually an extensive operation is performed which is not always necessary. Dr Jesup will review the histologic and pathologic data in relation to this disease.

She was seen by me first in January 1927. At that time her chief complaint was vomiting and pain in the right lower quadrant.

**Past History**—She has always been healthy, no serious illnesses or operations. Her appetite has been good but she has suffered from belching of gas. Her bowels have been constipated so that it has been necessary for her to take medication every night.

**Menstrual History**—Period every twenty four to twenty six days, flowing eight to sixteen days profusely. Rather profuse leukorrhea.

She has been married eighteen years and had one miscarriage which was instrumental. She voids once or twice at night and every two or three hours during the day.

**Present Illness**—Four days ago she had a sudden attack of cramps in the lower abdomen. She vomited six or seven times, the pain gradually centering in the right lower quadrant. On the following day the abdomen became sore to the touch. For the first two days following onset she had diarrhea, then three days of constipation, relieved this morning by a colonic irrigation. Today she feels tired and very weak. The abdomen remains sore and when she was examined at another hospital she was told she had a fibroid and appendicitis.

She had a similar attack six months ago.

**Physical Examination**—Slightly flushed and well nourished young woman. Slight systolic murmur over the apex area. Lungs negative. Abdomen exquisitely sensitive over the region of the appendix. A large fibroid can be felt in the median line and a second one to the right over toward McBurney's point.

On January 11, 1927, I operated on her at the New York Hospital. The uterus was found to contain numerous fibroids, one in the right lumbar gutter with an area of infection and beginning necrosis at this point. The sigmoid and upper rectum were densely adherent to the posterior surface of the cervix and vagina. These adhesions were separated with extreme difficulty by sharp dissection. When they had been separated a rather nodular long mass about 3 x 1 cm. was felt on the anterior rectal wall at the cysto-sigmoid junction. It was difficult to determine whether this was inflammatory in nature or a new growth. It was longitudinal in area and apparently did not obstruct the rectum.

As the patient was in no condition to operate should carcinoma be present and as the condition might be inflammatory in nature it was thought advisable to proceed with the hysterectomy and later determine the nature of the growth if any by a bacteriologic and serologic examination.

The hysterectomy was done in the usual manner leaving in the cervix both the body and neck. The patient had a rather stormy convalescence due to the fact that she was in poor shape because of dehydration before operation and due also to the fact that we were afraid to do much medication on the treatment by rectum with the knowledge of the mass present at operation.

She left the hospital at the end of the week and has been observed by me at regular intervals until this time. She has complained of gradually increasing pain. Her bowels move only by laxatives. She has been having no menstruation a week and following each time is very weak so that for at least the month she has been unable to continue her occupation. She has had extreme pain in the rectum emanated at the time when her menstruation usually comes. I

at these times she has occasionally passed blood and mucus at stool

Sigmoidoscopic examination reveals a normal mucosa over the mass which can be seen in the anterior rectal wall about 7 inches above the anus

Dr Lewis Gregory Cole's ray report is as follows: A number of films were made of the rectum and sigmoid after the injection of a small amount of barium. Following this film were made of the colon after the injection of the regular amount of solution. The rectum was apparently normal. The colon and upper half of the sigmoid were normal. There is a filling defect in the sigmoid near the junction of the sigmoid with the rectum. The lumen does not appear to be constricted by a band and there was no obstruction to the flow of the enema. This filling defect is by displacement of the barium in the lumen of the sigmoid as if there were something protruding or pushing into the lumen. I believe that this is some type of polypus growth or some growth attached to the wall of the sigmoid pushing into the lumen. I do not believe that this is malignant. The location is approximately 7 or 8 inches from the internal sphincter and more in the right side of the pelvis than in the left.

The diagnosis of adenomyoma of the rectovaginal septum in this case has been made for the following reasons:

- 1 Because the patient has had fibromata of the uterus
- 2 In the first operation this mass in the rectal wall was found attached to the lower end of the cervix and the rectovaginal septum
- 3 Because the mucosa of the rectum by proctoscopic examination is relatively normal
- 4 At the time at which menstruation would normally occur she has increased pain in the rectum with the passage of mucus and occasionally blood

The patient is becoming progressively weaker and signs of partial obstruction are gradually increasing. It is believed that operation is necessary although it will be one of extreme difficulty.

**Operation. Excision of 6 Inches of the Rectosigmoid End-to-end Anastomosis Under Ethylene Anesthesia.**—The operation



will not be discussed in detail as it is not felt that in this particular case the operative procedure has any unusual features. There was a very dense mass of adhesions that had to be separated around the cervical stump and after freeing the mass it was found impossible to do any plastic operation which would not cause further obstruction. On this account a resection with end-to-end anastomosis was determined upon. This was done without a clamp on the distal segment by suturing the posterior surface of the bowel on the mucosal side by interrupted sutures care being taken not to interfere with the blood supply and the anterior and lateral surfaces by inverting Cushing sutures. At this time a rectal tube was inserted by an assistant through the anus into the operative field and then pushed upward into the proximal loop about 4 inches above the proposed anastomosis.

An inner layer of suture was followed by a second reinforcing suture of chromic. The peritoneum was sutured above the anastomosis so that any leakage which might occur would be extraperitoneal. A rubber drainage was inserted into the pelvis extraperitoneally in the neighborhood of but not contiguous to the suture line. The remainder of the wound was closed.

**Postoperative Course**—The patient passed gas and fecal material through her tube for the first four or five days postoperative. The tube was removed on the seventh day. There was some fecal drainage through the anterior abdominal wound on the seventh day and this discharge continued for ten days when it ceased.

On the patient's twentieth postoperative day she had a chill, a rise of temperature with swelling and pain in the left thigh, groin and calf, evidently a left femoral thrombophlebitis. The treatment of this condition related by Dr. Stanley Benson in an article in this number.

The patient left the hospital on her fortieth postoperative day, having normal bowel movements every day, no pain, very slight swelling of the left leg and no more in the wound. Her condition at the present time seems excellent.

It has been stated that most endenteric anastomoses, the

rectosigmoid junction are followed by strictures and so we shall have to watch this case carefully to see that a stricture does not occur. Unfortunately we were left no other procedure than the one we followed.

DR D S D JESSUP Adenomyomata occurring outside of the uterus itself are sufficiently rare especially when they are found in the intestinal wall to warrant the report of this case. Of added interest is the fact that the tumor had been noted at an earlier operation and a correct diagnosis of its nature made. This was verified later by frozen section during the operation for its removal.

The symptoms produced by such growth in the muscularis of the gut are those of pain, hemorrhage and obstruction so that most of them are diagnosed as carcinomata. In this case the symptoms were those of obstruction.

This is the third adenomyoma of the rectovaginal septum that has come to us for diagnosis, the other two having been observed in 1913, the year that Lockyer was the first to recognize the nature of such tumors. Other adenomyomata of the intestine in our pathologic service during this period have been 2 cases in the large intestine, one the colon and the other in the sigmoid, both diagnosed as carcinoma. A third in the wall of the appendix was found in a routine examination of what was considered chronic appendicitis.

All of these three tumors in the rectovaginal septum have occurred high up, opposite the cervix, so that where hysterectomy accompanied the removal, the islands of endometrium could be detached from the rectal mucosa through the thickened muscularis almost to the cervical canal.

There are varying degrees of inflammatory infiltration which in some reported cases have caused vaginal ulceration. Pain may occur at the menstrual period from hemorrhage into the endometrial glands and cysts may form distended with this blood.

Pathology.—Adenomyomata are classified as benign growths composed of smooth muscle containing glands and stroma of the type seen in the endometrium of the body of the uterus.

There are several views as to how they arise but the most generally accepted is that they are developmental rests. They do not metastasize and the principal symptoms are those due to pressure from a growing tumor in the wall of a hollow viscus with resultant obstruction.

**Pathologic Description of the Present Case (No 15154)**—The specimen removed by operation is a piece of intestine 15 cm long. Along its antero-border at a point 4 cm from its lower end there is a thickening of the wall of the gut which is very



Fig 3.—Ad my m f g l sep m R t m l d pe  
d h ang t po t T h b lg g f th m h w g f th  
men

dense. Section was taken through the site of the section shown. On laying open the intestine there is a constriction of the lumen opposite the thickening in the wall. The rectal mucosa bulges over the projecting band but is normal in appearance without any evidence of ulceration. The thickness of the tumor here is 2 cm and it has a diameter of 3 cm and encircles only part of the gut. It is superficial and has the appearance of thickened mucosa and it enlarges above and below and laterally it is continuous with the muscularis of the cecum.

wall Anteriorly where it has been dissected away from the vaginal mucosa its surface is rough and irregular

*Microscopic Examination*—Frozen section of the fresh tissue shows a growth of smooth muscle scattered through which singly or in groups are gland lined by cylindrical epithelium and surrounded by varying amounts of connective tissue stroma composed of oval and round cell giving the characteristic picture of endometrium Paraffin section through the whole thickness of the tumor shows a rectal mucosa with normal gland

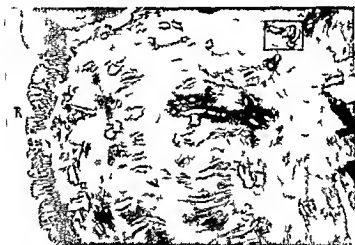


Fig 328—Ad my m f t g l sept m Lo po ph t gr ph  
h g th wh l th k f th t m R l t t t l m A  
La g d m t l g l d i y g l t t l g l d B O th g l d s c t t d  
th gh th th k d m s c l Block d o t f g l d d t m a  
h n h g h m g n f i t Fig 329

Just beneath the glands the stroma shows areas of inflammatory infiltration composed mainly of lymphocytes also edema and distended blood vessels The case travasated blood in the rectal mucosa and evidence of old hemorrhage in the adjacent muscularis as shown by pigmented phagocytes The endometrium glands extend through the whole thickness of the muscularis some of them lying close to the rectal gland (Fig 328 A) A large island near the vaginal edge is shown in higher

magnification in Fig. 329. Some of the gland show exudate in the lumen with poorly defined red cell. The microscopic

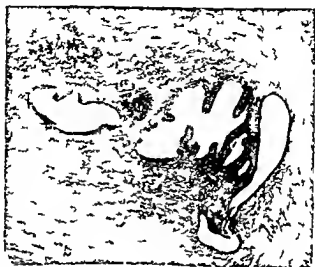


Fig. 329—Adenomyoma of the uterus. High power view of blocked tubal end. Figs. 328 and 329 show the typical histology of adenomyoma.

findings thus conform with the histologic structure of an adenomyoma.

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## CLINIC OF DR. M. STANLEY BROWN

### FIFTH AVENUE HOSPITAL

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#### INTRAVENOUS INJECTIONS OF GENTIAN VIOLET IN THE TREATMENT OF PHLEBITIS

ONE of the most dreaded bugaboos of a postoperative convalescence is I think phlebitis. How often in his daily rounds does a surgeon visit let us say a simple postoperative appendix or an obstetrician a normal postpartum case or a physician a typhoid patient and find a rising temperature a painful extremity which on examination appears cold swollen and often shows a portion of a superficial vein traced in red on the skin? What are the problems and difficulties which at once present themselves to his mind?

He is faced with the possibility that unless the leg is kept at rest for several weeks a piece of the clot may break off and cause disability or even death to the patient. On the other hand the patient who is probably drawing a sigh of relief that the worst of his troubles are over is greatly alarmed by the enforced rest and further loss of time and distressed by the pain and fever and general discomfort which attends a leg elevated and kept constantly in one position.

After reading Shallenberger's encouraging report on the intravenous use of gentian violet in phlebitis we tried it out in 7 cases of our own. Our results coincided very closely with his and were so satisfactory that we went over the literature on gentian violet to see what work had been done on its action and uses. From this review the earliest work appears to have been done by J. W. Churchman<sup>1</sup> of Cornell. He began by studying the effect of gentian violet on different types of pathogenic organisms and on tissues. He found that gentian violet has a positive or negative action on organisms comparable to the Gram stain but this positive or negative action refers to

its power of inhibiting growth rather than to the staining power. However it is interesting to note that the Gram positive organisms are also gentian positive in that they are inhibited by the presence of gentian violet. This he discovered to be particularly true with respect to staphylococcus. He feels that the dye acts by bacteriostasis or as he expresses it by genesisstasi — an inhibition of reproduction rather than a bactericidal action.

In connection with tissue work Churchman found that gentian violet used intravenously disappears from the blood stream in from one to two hours and is then absorbed by certain organs of the body and stains the cytoplasm and the nuclei of their cells but does not inhibit the function of the cell. In other words it is non-toxic to tissues. Churchman's conclusions have been confirmed on this point by D. S. Kuller who has demonstrated that cultures of tissues continue to show growth after staining with gentian violet in dilution strong enough to kill organisms and will furthermore eventually excrete the dye.

Churchman also carried on a series of experiments on *Bacillus coli* which demonstrated that certain strains of this organism usually uninhibited by gentian violet were inhibited in growth if the gentian violet was heated to 50° C.

Burke and Newton in an attempt to standardize the gentian violet solution found that the pH should be neutral or slightly alkaline and that the solutions should be made up fresh in order to obtain good results. Sterilization produced deterioration in the dye. Very satisfactory results were obtained when the dye was dissolved in a solution of 3 per cent of sodium bicarbonate or a solution containing 100 c.c. of distilled water in which has been dissolved 0.300 gm. of potassium dihydrogen phosphate and 0.38 gm. of potassium hydrogrophosphate. However sterile distilled water alone may be used as a solvent for the dye though the results obtained by its use are not as consistently good.

Walker and Seely did some experimental work on the relative merits of acriflavine, gentian violet and imidazole and the conclusion was reached that gentian violet is useful only in staphylococcus infection in which it has been

effect on streptococcus than on staphylococcus and acriflavine was more effective on staphylococcus than on streptococcus infections. They felt however that the direct contact of the dye with the organisms was necessary for good results.

Also after experimental work E. W. and A. E. Stearn<sup>20</sup> felt gentian violet to be superior to mercurochrome *in vitro* as the latter requires a medium more acid than body fluid in which to work effectively.

The recorded results in the use of gentian violet intravenously for staphylococcus sepsis are as follows:

Churchman reports 2 cases of sepsis in which gentian violet was used with success.

Horsley reports a series of 38 cases of which 11 were cured, 10 showed marked improvement, 9 were slightly improved and 8 showed no improvement. An analysis of these 8 cases however showed that they were mixed and were not pure staphylococcus infections.

Young and Hill<sup>9</sup> used successfully gentian violet in 5 cases of Staphylococcus septicemia. Two years later before the Michigan Medical Society Young<sup>19</sup> reported 2 cases and said he could report 30 successfully treated with gentian violet if time permitted. He thought mercurochrome should be used first and gentian violet second.

D. T. Smith reports 1 case successfully treated with gentian violet.

Out of 11 cases reported by Hinton<sup>24</sup> 7 were cured by intravenous injections of gentian violet.

In 2 cases in which the dye was used by Hall, 1 was cured and 1 died but both were *in extremis* when the treatment was instituted.

Brill and Myers treated 3 cases one of which was a staphylococcus infection and the other two gonococcus. By laboratory experimentation they did not find that the growth or organism was inhibited by exposure either to mercurochrome or gentian violet.

The dose used in most of the foregoing cases was either a 1 per cent or a 0.5 per cent solution of gentian violet using on the average 5 m. of dye per kilogram of body weight.



Experimentation has been extended to other types of disease. Faber and Dickey<sup>7</sup> report the successful treatment of a case of thrush with the dye. Goldberger<sup>1</sup> used it in 2 cases of paresis with a 1:25,000 solution of gentian violet injected intraspinal two or three times a day after drawing off the spinal fluid. In conjunction with this treatment some intravenous injections of mercurochrome were given. One of the patients improved but the other case terminated fatally.

Churchman<sup>7</sup> found that gentian violet acted favorably in joint conditions and in wounds. He used gentian violet successfully in a diphtheria bacillus wound infection where serum treatment had failed. He went even further and developed an apparatus for aspirating joints, washing them out and staining them with gentian violet.<sup>8</sup> By experimentation he demonstrated that gentian violet introduced into the intestinal tract penetrates the mucosa as far as the muscular layer and in a joint cavity passes into the synovium and the underlying connective tissue layer.

Abraham used the treatment successfully for furuncle around the nose and in the outer ear also in mastoid wound and in sinuses. In these last two a 1:200 solution was employed. As a spray and gargle for infections of the tonsils, larynx and pharynx it was found to be of service even when the organism was streptococcus. However, the mucus secretions of the nose and throat made it difficult for the dye to penetrate the tissues.

Davis<sup>6</sup> in his empyema work followed aspirations of pus, replaced one half of the fluid removed by a 1:1000 solution of gentian violet. This was found to be non-irritating and cleared up the cavity without resort to drainage.

Conner of Rochester, Minnesota, proceeding on the theory that pernicious anemia is caused by gastric intestinal infection and that gentian violet is a good disinfectant for the alimentary tract treated successfully 18 cases with intravenous injections. However, general hygiene and diet were carefully supervised. Diluted hydrochloric acid was given by mouth and in some instances blood transfusions were employed.

Gunn<sup>11</sup> of London who appears to have been the only person outside the United States to employ gentian violet treated 10 cases of endocarditis in children 8 of whom were cured or the course of the disease arrested In the other 2 cases one was unaffected and the other showed bad results probably due to the fact that fluid was added to an already embarrassed circulatory system rather than by any direct ill effects of the dye

Major also records a case of endocarditis successfully treated with gentian violet

Sanderson<sup>9</sup> did some experimentation on the blastomycotic group and found that gentian violet inhibited growth here also So far there is no report of it being used clinically

Shallenberger<sup>8</sup> of Atlanta reports 11 cases of phlebitis successfully treated by him with intravenous injections of a 0.5 per cent solution of gentian violet using about 46 c c per 100 pounds of body weight The injection is given very slowly The promptness of the results was quite startling The temperature dropped to normal within twenty four hours the pain and discomfort ceased and the leg returned to its normal size and consistency within a few days No serious reactions were noted in any of the cases In a few instances the patient complained of a tightness in the chest and sweating cyanosis was noted but all of these symptoms disappeared in ten to fifteen minutes

Mooser and Monoe have reported several cases of sepsis in which they used 15 c c of a 1 per cent solution with good results—one of these cases being thrombosis of the femoral vein and sepsis following delivery

During the past three months at the Fifth Avenue Hospital we have used gentian violet successfully in 2 cases of phlebitis which I will report in detail

Case I—Miss S who was operated on at the Fifth Avenue Hospital on Dr Bancroft's service on October 10 1927 for an adenomyoma of the rectovaginal fossa reported elsewhere in this issue

Following operation which necessitated a resection of a



on satisfactorily until October 30th twenty days postoperative when she began to complain of pain in the left calf thigh and groin. The entire leg became pale swollen and tender. The temperature rose to around 103° F and continued high until November 4th when 45 c.c. of 0.5 per cent gentian violet solution were given intravenously in the arm. At that time her thigh measured 24 inches and the calf 14 inches. That night her temperature went to only 100.8° F (Fig. 330) and went down steadily to normal. The pain in her leg ceased and she felt much more comfortable. Although her temperature remained down a second dose of 50 c.c. of the 0.5 per cent solution of the dye was given on November 9th five days after the first dose. Following this injection the patient complained of a sense of nausea and appeared cyanotic. The pulse however remained steady and in ten minutes she felt well again. Four days later the thigh measurement had decreased 2½ inches and the calf 1 inch and they had both returned to normal consistency and color. From then on her course was quite uneventful and she was allowed up in another week. At follow up the left ankle showed moderate swelling which lasted for two to three weeks and then disappeared entirely.

**Case II**—Mr. P. operated on at the Fifth Avenue Hospital on Dr. Bancroft's Service November 19, 1921, for drainage of a perinephritic abscess. Four days postoperative he complained of pain in the left leg. The calf was cold and swollen. The following day 50 c.c. of 0.5 per cent solution of gentian violet was given intravenously. The calf at that time measured 16 inches. The pain left almost immediately and the patient complained of no further discomfort from the leg. In this case the temperature did not drop but we think this may have been due to a pleurisy as the patient complained of pain in the chest and of cough and at that time x-ray of chest confirmed this diagnosis (Fig. 331). Four days after the first injection the calf measurement had decreased 1 inch. On December 2d nine days later another dose of 50 c.c. of gentian violet was given intravenously although the patient's temperature was

coming down. In this case the patient got a slight reaction to the dye at both injections but they were very transitory and caused no real inconvenience. From then on he progressed well and had no further trouble with that leg except slight swelling of the ankle which cleared up before he left the hospital.

Although the reports on the use of gentian violet are at the present time scattered and varied I feel that there is a very definite place for gentian violet in cases of sepsis and infections and especially in phlebitis. This last condition is seen fairly frequently as a postoperative complication and is often a very

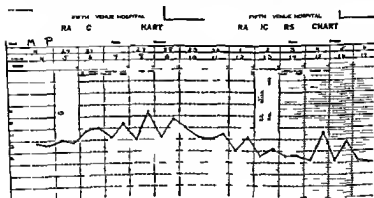


Fig 331

serious one. If the results continue to be a uniformly satisfactory in reducing the discomfort and loss of time to the patient it will be very worthwhile.

Conclusions—1. Gentian violet has a bacteriostatic action on Gram positive organisms especially staphylococci.

2. It has been found of use especially in the treatment of staphylococcus septicaemia. The dosage is 5 m g per kg body weight and is used in a 1 per cent or 0.5 per cent aqueous solution.

3. Gentian violet has been used both with and without success in the treatment of thrombophlebitis, pyaemia, abscesses, infected joints, empyema, mastoid sinuses, cellulitis and on blastomycotic cultures.

4 Thus far in the literature 14 cases of phlebitis treated by intravenous injection of gentian violet have been reported. Forty five to fifty c.c. of a 0.5 per cent aqueous solution of gentian violet have been used. The results have been uniformly good and have given immediate relief from pain, a drop in temperature within twenty four hours, a diminution in the swelling in four to five days, and the amount of time lost by rest in bed is greatly reduced. From our 2 cases we find the following results:

Gentian violet given intravenously in 2 cases of phlebitis shows:

- 1 Immediate relief of pain in both cases
- 2 Drop in temperature within twenty four hours in one case. The other case was complicated by the presence at the same time of pleurisy.
- 3 Reduction of the swelling in the leg to normal in five to seven days.
- 4 Patients showed a transitory reaction to the dye in three out of the four doses given.
- 5 The length of loss of time was greatly reduced in both cases.

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CLINIC OF DR. KINGSLY ROBERTS AND  
SPRAGUE CARLTON

FIFTH AVENUE HOSPITAL

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AN INTERESTING CASE FOR RIGHT LOWER QUADRANT  
DIAGNOSIS

In this patient we are presented with a neat question of diagnosis as well as one of treatment.

Here is an Italian male forty years of age whose chief complaint is pain in the right side radiating into the groin sudden in onset and accompanied by nausea and vomiting.

His previous history includes nothing of importance except the admission that he had a chancre twenty years ago for which he was vigorously treated. To the best of his knowledge he has never had any skin eruptions or nervous disorders which we could attribute to the secondary or tertiary manifestations of syphilis.

He was admitted to this hospital one year ago. At that time he complained of left-sided pain accompanied by nausea and vomiting. He stated that his first attack of pain came three years previous but in the interval he has had no trouble.

His record of that admission shows that a gastro-intestinal examination disclosed no gross pathology in this system—his Wassermann reaction twice and film made of both kidneys ureters and bladder without pyelography showed no positive shadows. His urine showed blood occasionally no albumin or sugar and no calculi were found in it. He was discharged after one week without symptoms with a diagnosis of renal calculus but no stones were identified.

On admission this time he presented a picture which was not by any means clear cut. He was in violent pain mostly in the right lower quadrant.



The pain radiated down into the groin and was accompanied by frequent and painful urination. He was nauseated vomited frequently and had a mass in the right lower quadrant which seemed to be about as large as two fists. This mass was extremely tender fluctuant and seemed encapsulated. His abdo-



Fig. 332.—F. J. before operation. b. l. f. w. t. h. l. l. f. t. h. t. d. l. m. b.

men was diminished generally so much that he could not get the limit of the mass.

His general condition spoiled the kidneys pale and pesty his pulse rapid and his temperature but 100°F.

We gave him opiate hoping that we could get him to try x-rays or a pyelogram. The urologic consultant did not think

such a procedure advisable because of the general condition and so we had to rely upon other data for guidance

His urine has showed occasional blood traces of albumin but no casts. His blood count showed 8500 whites of which 80 per cent were polymorphonuclears

Colonic irrigation have brought very little relief. The first x ray was so confused by the large amount of gas in the colon that it was valueless

His condition has not improved. During the past twenty four hours he has developed a temperature of 103° F and a pulse of 120. His white cell count is now 16 000 with 90 per cent polymorphonuclears. His general condition seem worse although he is extremely cheerful and seems to have no other worry except that he cannot get enough cigarettes to smoke

The mass in the right lower quadrant is more tender and his distention has not been diminished at all. This distention plus his vomiting has suggested some type of ileus which we have felt may very possibly have its origin outside of the gastrointestinal tract. As you know any retroperitoneal inflammatory process may give a picture so closely resembling intestinal obstruction that not infrequently have careful men gone into the abdomen expecting to find some mechanical blocking of the tract only to be confronted by a perinephritic abscess or some similar retroperitoneal focus

There are three possible diagnoses

I Intestinal obstruction

II Appendiceal abscess and

III An abscess connected with the right kidney or ureter due to blockage of this tract by a stone

Intestinal obstruction can be ruled out except as a chronic affar and paralytic ileus by the duration of the disease

In favor of appendiceal abscess are The mass which may have no connection with the kidney at all the inflammatory type of blood count the vomiting and nausea and the abdominal distention and right lower quadrant tenderness

In favor of urinary tract abscess are The previous history frequency of urination blood in urine radiation of pain into

groin and pent and the fact that there is tenderness on pressure over the right kidney region posteriorly.

We have just had him up to the x-ray department and here is the film (Fig. 333).



Fig. 333—Lateral view of the lumbar spine showing a large, dark, irregular mass in the lower thoracic region, possibly a tumor or other pathological process.

The lateral x-ray has simplified the problem and emphasizes the fact that metastatic disease is the watch for chance to check laboratory and clinical.

We are now prepared to give percutaneous operation and have hence been dealing with the transperitoneal route of approach. We must be

don symptomatic treatment and like Deaver make our diagnosis by means of the aseptic scalpel

We feel the patient is a bad risk and are carrying him therefore on light anesthesia intending to do as little as possible

As you can see he is placed on his left side with the right kidney exposed. I am making a short incision just below the lower border of the costal cage and parallel to it bringing us down through the lateral abdominal muscles into the right kidney region without showing us frank pus as yet. I believe I can feel the lower pole of the kidney and below it slightly medial to it is a tense mass which I believe to be our abscess. This mass can also be palpated through the anterior abdominal wall. I will open it by blunt dissection if possible as it is always risky to allow a sharp instrument to get beyond your sight in this region—there you are!

The fluid is frank pus and I should say there are about 10 ounces of it. I do not see anything I can identify positively as urine. We will introduce two firm walled black rubber drainage tubes into this cavity and close the incision with interrupted dermal sutures.

The anesthetist tells me the patient has withstood the procedure well and we should get immediate relief from the operation.

**Comment**—This abscess cavity which we have opened does not belong to the kidney but is I feel a perireteral affair. I am not surprised we did not get stones although I am surprised we did not find urine. The material which comes from the drainage tube during the next forty-eight hours will be watched with great interest.

**Subsequent History**—The material draining from the tubes proved to be urine. The next day we found the patient relieved of his pain. His distention was practically gone and he was a comparatively comfortable man. The tubes were connected by siphon to a large bottle and the quantity of urine excreted was measured daily. At the end of two weeks the tube came out of their own accord and from that day no urine drained from the wound. The quantity passed by the bladder increased

and the patient was turned over to the genito-urinary department for further study.

**Discussion by the Urologic Section—DR SPRAGUE CARLETON.** The calculus shown by x ray at the time of operation to be on a level with the fourth lumbar vertebra (Fig. 333) de-



FIG. 334.—The following patient had a hard lump in the bladder.

scended during the next two weeks to the bladder where it lodged (Fig. 334) without discomfort to the patient for an equal length of time. It obstructed the passage of a urethral catheter when instrumentation was first attempted after the abatement of his pyelitis. Two days later

a No. 11 ureter catheter was passed without difficulty and an immediate x ray (Fig. 335) indicated the dissipation of the calculus.

With the extra vision afforded by hindsight this case offers points of interest over and above the deep concern afforded by



Fig. 335—Showing the location of the calculus before the passage of No. 11 ureter cath.

the development of its complicated clinical picture while in the hospital.

Thirteen months before this patient was found to have 10 ounces of pus in his flank he was a hospital patient with a frank history of renal colic. Within three days his painful

symptoms having abated and his x ray being definitely reported negative for calculus he was allowed to leave. At that time this case might have been classified as one of the rather common clinically renal colic case without demonstrable pathology. As such its subsequent course may be enlightening. The facts of this case make clear the necessity of a searching follow up service both from the standpoint of the individual patient and the accumulation of data.

The follow up service in urology has its particular difficulties. You cannot sympathize with patients who postpone follow up so that prompt for them a justly earned punishment of discomfort of a pyelogram. And yet had the clinical picture dominated the negative findings afforded by the plain x ray the extensive infection in this case might have been avoided.

It is of interest that at this point in this case that the hospital pain was in the left side and had he remained longer a pyelogram would undoubtedly have been made of the dead kidney. The active finding might seem to have added another case of renal colic without demonstrable pathology despite the fact that pain from kidneys is not infrequently referred to the opposite side. The bilateral pyelogram is so generally condemned that today it would hardly be regarded as impractical and yet without it many of our cases go with but one laparotomy particularly when the side first taken produces negative results. It might not be amiss to speculate regarding our reasons for hesitating to resort to pyelography. The history of medicine abounds in contradictions resulting from earlier faulty technique. In this particular case had the machine allowed the kidney not increased in size so rapidly a pyelogram might have been made and if so the procedure would have been blamed as the cause of the abscess and other complications and the finding of pyelography would have been really though falsely refuted.

Follow up pyelographic and functional data might furnish a study as to how much and how fast the contractility of the scars of this case may interfere with contraction and consequently function and suggest a line of follow up treatment for the future.

the free intake of water that we stress in these cases without regard to the colloidal concentrations that are best suited to keep in solution the offending salts

The specifically reported negative x ray for calculi of the upper urinary tract—in this case thirteen months before finding a definite shadow by the same means—makes it of interest in working out the time element in the formation of calculi

Conclusion—A serious general condition of a patient is not a contraindication to cystoscopy and ureteral instrumentation for information or drainage when the general condition is thought to be caused by upper urinary pathology and in this particular case we believe early ureteral instrumentation by promotin drainage might have been of marked benefit





# CLINIC OF DR. KINGSLEY ROBERTS

## FIFTH AVENUE HOSPITAL

### MBGV 5

(A P 1 m y R p o t)

WE are working upon the problem of operating room asepsis and it has led us into a very important refinement of technic.

In testing our operative steps for asepsis we found that from the very instant that the skin incision was made cultures taken showed the presence of bacteria—usually staphylococci and streptococci. We were using the usual 2 per cent iodine for skin preparation preceded by ether and followed by alcohol. This could mean only one thing—so we started out to find a preparation which would give us absolute asepsis.

Tinker had suggested neutral acriflavin and gentian violet in alcohol. This mixture was fairly expensive because of the acriflavin. So we substituted methylene blue.

The mixture which we are now using under the term MBGV 5 is 5 per cent methylene blue and 5 per cent gentian violet in 50 per cent alcohol. It is a very deep blue and stains everything it comes in contact with but can be removed as we will show later.

We have subjected it to various trials as described in an article to be published later but in general they are as follows.

We first determined the incidence of positive growths when cultures were taken from unprepared skin by a method which we considered practically individual proof. As you know most experiments on skin sterilization are conducted under varying technic such as scraping or rubbing the skin. The maneuvers can be performed with varying intensities hence varying results are obtained. Our technic is so simple that we feel it is not a variable factor. Small swabs are made by wrapping the ends of wooden application sticks with a uniform amount of cotton

and sterilized in small tubes. When cultures are to be taken the swabs are moistened in sterile bouillon and held at right angles to the skin for thirty seconds. The pressure used is just enough to hold the swab in contact with the skin. The swabs are then rubbed off in the sterile bouillon and this incubated for seven days. If no growth occurs the result is charted as negative. If growth occurs the organisms are identified by Gram staining and charted as positive.

Our tests of unprepared abdominal skin showed that when no antiseptic was used about 80 per cent of the cultures were



Fig. 336

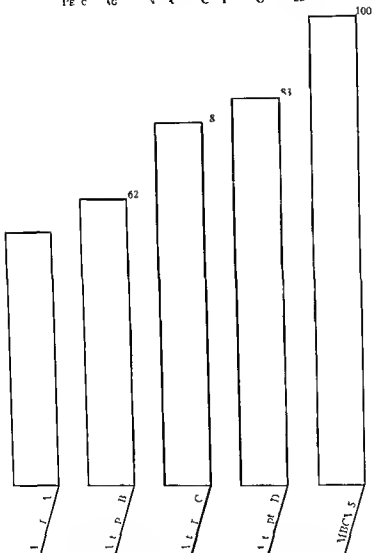
positive. This figure roughly compares with those found by other workers.

We next took children in the ward who were under medical supervision without infective lesions. We divided their abdomen into five areas starting from the umbilicus, as shown in Fig. 336.

To each area we applied swabs, to plates and to cultures. The results after a period of 24 hours. The results obtained were as follows:

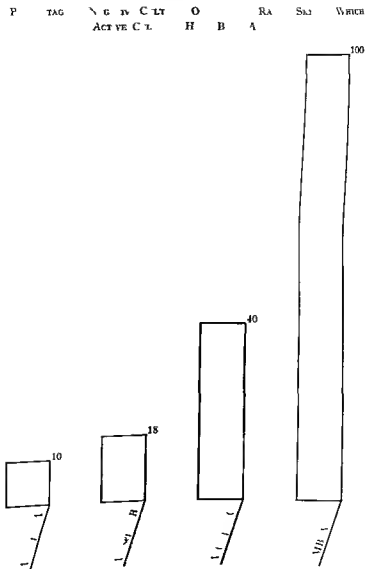
CHART I

P E C A G N A C T O ED



Then e felt that if we could add bacte a to the skin so that the area was known to be contaminated especially if we

CHART II



used the usual pus forming bacteria plus some member of the anthrax group (the Gram negative pore bearers) we could obtain more interesting results. This was first done on rabbits. The results were as shown on page 1054.

Next feeling that we had a positive and absolute antiseptic we felt that we could add bacteria to human abdomens and obtain results which were directly applicable to the operating room. This was done and the results shown on page 1056 obtained.

In this set of experiments we varied the antiseptics used as indicated testing a product known as metaphen and acriflavin in acetone alcohol as well as iodine 2 per cent and mercurochrome 5 per cent.

This leads us to believe that we have a skin antiseptic which is as nearly 100 per cent efficient as any yet developed and now we can proceed to study the sources of subdermal contamination.

MBGV 5 can be removed from the skin by the immediate use of soap and water or by wiping off with a sponge soaked in Hypozone but this removal should not be done until after the operation and even then not from the actual wound area.

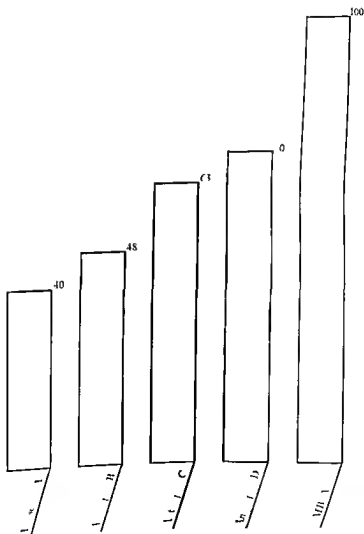
MBGV 5 stains tissue hence skin coverings should immediately be applied as soon as the skin is incised. Cultures taken under these pads up to two hours have proved consistently negative in over fifty trials.

Though the courtesy of The Robertson Bleachery and Dye Works of New Milford Connecticut we have found that these stains may be removed from linen by treating them as follows: Boil one hour in 7 to 8 Twaddle caustic soda wash out well with boiling water. Treat for one half hour in a solution of Twaddle sodium hypochlorite in 180 F temperature. Wash out well in hot water.

This is a brief preliminary report of our work further details of which we contemplate publishing later. There is a great deal of bacteriologic work which must be done to verify the completeness of our antiseptics.

CHART III

P	N	CUL	O	HU	S	O W	H
	A	CULT	ES H	B	A		



CLINIC OF DRS KINGSLEY ROBERTS AND  
D S D JESSUP

FIFTH AVENUE HOSPITAL

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ESOPHAGEAL STENOSIS

THE patient was admitted to the hospital ten days ago at which time he was one week of age.

Family history irrelevant.

The child was born at full term normal delivery. Since the day of birth he has been troubled with considerable mucus in the throat so much so that the physician has withdrawn large quantities of it daily. The child has been breast fed but has vomited every feeding since birth. The stools have been sparse consisting of small hard masses. The child has been voiding normally sleeping quietly between feedings and seems to vomit without pain.

During the past two days he has developed marked cyanosis during feedings.

Physical Examination—A rather thin child of stated age color fair not markedly dehydrated chest without signs of gross pathology no masses in the abdomen extremities apparently normal no enlargement of the thymus. The anterior fontanelle moderately depressed but there is no other positive physical finding. Weight on admission 4 pound 10 ounces. Temperature about 102° F.

It was at once observed that all feedings were promptly returned and that following the third feeding the child became markedly cyanosed. An attempt was made to perform gastric lavage but the tube could not be inserted into the stomach although a large quantity of mucus was removed from the esophagus.





Fig 33



F 319

An x ray examination of the same points of the film are reproduced in Fig 337-339. Following is a copy of the x ray report

Film of the chest shows no evidence of an enlarged or persistent thymus. Films of the esophagus after the administration of a small amount of barium under fluoroscopic control show the following. The barium was seen to pass down the esophagus to a point just below the sterno clavicular articulation where it met with obstruction. The esophagus above this point was dilated and after three attempts to get barium past the obstructed point none of it entered the stomach or the esophagus below. Films made in the anterior posterior and oblique directions show the obstruction in the esophagus at the point indicated in the previous examination. This point



Fig. 339

is on a level with the 4th dorsal vertebra. I believe that there is a complete stricture or atresia of the esophagus at this point.

Respectfully submitted

Lewis Gregory Cole M. D.

Robert E. Pound M. D.

This history coupled with the physical and x-ray findings of course established a definite diagnosis of esophageal stenosis and there was only one procedure to be followed.

Under local anesthesia Dr. Clay Ray Murray performed a gastrostomy and feedings were begun at once in order to maintain the child's weight. Feedings were continued and it was

again observed that the installation of food into the stomach was frequently followed by crying and spit up material. This material was analyzed by the laboratory and was identified as milk. The fact that we got milk in the mouth after it had been installed into the stomach brings out the very interesting fact that there was a side track communication by way of the



Fig 340—1. White placenta through the abdominal wall. B. Dissection of the stomach and duodenum. C. Dissection of the stomach and duodenum. A. Dissection of the stomach and duodenum.

bronchial tree between the larynx and the pharynx and the mouth. Dr. Bartlett has pointed out the point that it has been his experience that almost all of the cases of congenital esophageal stenosis have had similar bony plaques.

Fig 340 is a picture of the specimen.

Autopsy Report (Dr. D. S. D. Jessup)—Male infant 4 months long. Adipose cavity. Epigastrum has operative wound.

appears to be in good condition and leads to stomach. Peritoneal cavity examined before disturbing operative wound shows slight congestion of loop of intestine with some turbid fluid in the culdesac. Scattered all through the cavity between loops of intestine are flakes of apparent fat or casein.

Liver enlarged congested

Spleen enlarged dark and firm

Liver heart and lungs removed together. Probe passed from stomach up through esophagus passes out from trachea above through what appears to be a communication between esophagus and trachea at about the level of sternal notch. Probe passed down into upper end of esophagus is arrested at level of upper end of sternum opposite the point where esophagus becomes continuous with upper end of trachea. The left lung lower part of upper lobe deeply congested firm. Lower lobe shows marked congestion and is rather firm.

Left adrenal normal

Left kidney fetal lobulation

Supernumerary spleen—1 cm in size

Right kidney and adrenal same as left

Large and small intestines normal. Bladder distended with urine.

*Final Diagnosis*—Congenital stricture of esophagus. Inhalation bronchial pneumonia. Peritonitis.

*Bacteriologic Examination*—Culture from peritoneum: *Bacillus pyocyaneus*, staphylococci.

*Microscopic Examination*—Lungs: There is a peribronchial infiltration with round cells, many of them polynuclears with congestion of the capillaries. Some of the bronchioles are filled with polynuclear exudate.

Heart muscle normal

Liver congested

Thymus: Exudate in some of the corpuscles

Adrenals show congestion

There is marked congestion of the spleen

The tufts of the kidneys show engorgement of the capillaries.

There is congestion of the blood vessels elsewhere throughout the parenchyma

*Microscopic Diagnosis*—Bronchial pneumonia congestion of spleen kidneys and adrenals

*Comment*—We feel that if we were confronted again by a similar case there are two procedures which might be of value. The first is that instead of doing a gastro-tomy we would do a jejuno-tomy in order that we might not fill the stomach with material which would subsequently be forced up to the lungs. We could nourish our child sufficiently through the jejuno-tomy to build it up in order that we might try the second procedure which would be extremely radical but justified because of the high mortality. The suggested procedure would be as follows. A short incision into the stomach to the left of the midline and the introduction of a small operative cystoscope. A second cystoscope would be introduced into the esophagus from above and under fluoroscopic control an attempt would be made to establish communication between the ends of these two instruments and subsequently introduce a catheter down into the stomach. To the best of our knowledge this procedure has never been tried but we believe it might be of value.

## CLINIC OF DR. DONALD GORDON

### FIFTH AVENUE HOSPITAL

#### TWO SPLINTS IN USE IN THE FIFTH AVENUE HOSPITAL

SPLINTS which can easily be made from inexpensive material and which can properly perform the function of adequately and comfortably immobilizing or affording support to parts the joints of which require movement are essential parts of modern surgical equipment. The material should be inexpensive the splints should be adjustable and easily applied by anyone. They should be efficient for the purposes demanded and above all should afford comfort to the patient which is usually not an attribute of all splints.

The two splints presented we believe fulfil these requisites for certain surgical purposes.

The first device is for the support of the hand and fingers with the object in view of permitting movement at the wrist or metacarpal joints or by additional modification at both points. The indications for such service arise from the following lesion:

**Bone** Fracture about the wrist after a period of immobilization when it is desirable to start with motion with certain resisted movements or to retain the hand and fingers in an extended or flexed position between movements and permit the patient to voluntarily use the muscles at will.

**Tendons** After tendon suture where specific positions are indicated to prevent too great strain on the suture line at the same time allowing movements of tendons and muscles. This splint enables the surgeon to secure early motion of these parts to limited degrees without strain and inside the threshold of pain which tends to prevent atrophy of disuse and the re-

establishment of early function where tendons are in danger of adhering to their sheaths

**Arthritic process**—Where painful joints require support while active movements are instituted to prevent atrophy of disuse or contractures

The splint is made of galvanized or tinned telegraph wire of about 1 or 3 gauge. It can be made of Bessemer steel rod of suitable size. The tool required are a made at home heavy pair of pliers, small round vice, a hacksaw file and hammer are helpful. These are found in any hospital equipment.



Fig. 341.—Wire splint

The views of the splint in the picture show the manner in which the wire is bent. There is one piece for the forearm and arm and the second piece for the hand and finger. The ends of the forearm piece terminate in two small loops just large enough to encircle the vice of the distal part. It will be easy to mount. The distal half is formed into a U shape with sharp angles at the corners. The upright is held in the elastic or spring attached are sufficient to hold each other in the same plane as the half piece. They are then bent vertically upward at a point 1 inch in front of the distal part. It is right angles to it. This allows a small part to be grasped by the

distal eye of the forearm piece. These eyes are opened and clinched on the distal hand piece completing the wire part. Wide adhesive is used to fill in the space between the sides of the splint. The forearm and hand rest upon this with cotton batting to give protection. The adhesive plaster is left loose to form a concave surface to receive the arm and forearm but the hand piece is stretched flat. For a cock up the elastic bands are attached as shown and the upright pieces are bent to an angle of 45 degrees. The forearm is strapped to the splint also the arm which prevents the splint riding backward when the hand is extended. A reversal of the traction lever to a downward direction will form a flexion splint for the



Fig. 342.—Splint depicted as if positioned

hand. With suitable adjustment of the elastic lengthening of the hand piece with sufficiently heavy material traction may be applied to hand and finger.

The photograph (Fig. 341) shows splint as adapted to a case of epur of lacerated tendons. The second photograph (Fig. 342) shows the splint applied to the case for flexion and extension of the hand at the wrist joint.

The elastic support is formed by long rubber band. The strength depends upon the size and number of band used. The smoothness and extent of function is dependent upon the length of the elastic control which should be as long as possible. Where more powerful tension is required one can secure in the Ten Cent Store curtain spring which are most excellent.



The other splint (Fig. 343) is unique in that it can be made from material which is daily being thrown away by hospitals and the public as a casual view of any waste paper collector's wagon will reveal. It forms a temporary splint for the ankle which is difficult to duplicate unless one uses the Cabot or Volkmann's posterior wooden one.

Though it seems on first appearance to be rather fragile when in place properly bound it affords sufficient support and comfort to a region for which a similar splint is not easily

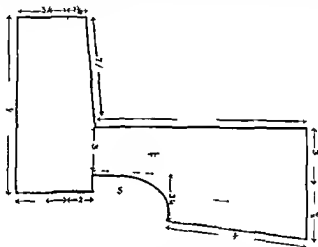


Fig. 343—Cart board splint

secured. Its use is not confined to the hospital. In fact its greatest field is to the practitioner who may be caught without any equipment. It was designed in such an emergency. It is made of discarded carton boxes. These cartons have become a common substitute in place of wood for shipping purposes and it is astonishing how much of this material is thrown away. The cartons are separated by putting the angles where they are joined with pocket knife. In the hospital a suitable number of such sides may be obtained. In the splint room for use as required.

To make two pieces of suitable size are taken. On one of them a rough pencil sketch is made after the pattern shown in Fig. 343. The size depends upon the size of the limb to be splinted and can readily be cut out by rule of thumb. For purposes of description see the dimensions on Fig. 343. This sketch was made from a plint cut out quickly by eye and measured by the artist. Obviously any required dimension may be used to suit the purpose for which the splint is to be used.

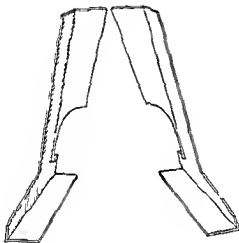


Fig. 344



Fig. 345

Fig. 344 345—Correct board plint

A second member is cut out the exact duplicate of the first or they can be cut out together by laying the one with the sketch on top of the blank. One side is then taken and folded on the dotted lines so that I forms a right angle with II and II a right angle with III. Both of these folded leaves are bent to the same side of II shown in the right hand figure of Fig. 344. The other member is then folded in a similar manner but the leaves are bent just the opposite to those of the first member as is shown in Fig. 344.

The two members are then placed together with the vertical

foot piece overlapping and coinciding. The horizontal piece will then overlap and the splint take the form of Fig. 345. A piece of adhesive plaster is used to hold the two foot piece together while the leg pieces are left free to adjust them close to the width of the leg. This forms a posterior leg splint with right angle foot support. This angle can be varied to suit the need of a case. An opening is present for the heel. This opening should be cut long enough so that the popliteal artery is well above the tendon Achill. The heel is kept from bed sore by the extension downward of the foot piece. The splint is used by laying a large piece of cotton wadding (on abdomen) in leg piece and in foot piece. The leg and ankle are then placed in this apparatus applied. Enough cotton should be used to cover the front of the leg and dorsum of foot. Should the carton board not be stiff enough on the side at the junction of the leg and foot piece this can be reinforced by carton board or piece of wool such as the straight splints found any place.

In extension or elevation of the foot can be secured by sliding the sides of the leg portion up or down as may be necessary to secure the position.

By suitable lengthening of the different dimensions of each member a right angle elbow splint can be made.

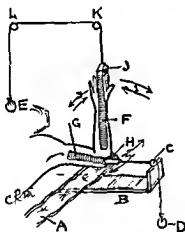
As it is made from discarded material to take the one should have little compunction to again convert it to the waste heap.

# CLINIC OF DR CLAY RAY MURRAY

## FIFTH AVENUE HOSPITAL

### ACTIVE MOBILIZATION FOLLOWING REDUCTION OF FRACTURE DISLOCATION OF THE SHOULDER

PATIENT L P aged fifty three Case No 30856 admitted November 3 1927 to the Surgical Service of Dr F W Bancroft



F g 346—D gr mm Sh g t t pe ft t t  
m t f d l cat f h ld th f t f g t t b ty f h m ru  
A p m tt B b d h g m p l t ly l d b th t  
th h t p ght t t p j t g d t wh h sc d p l l y C D  
d F p se t ght j t ff t t p l l j t f p t th f t  
d j t ff t t t b l h ght f th f m th ve d  
F d G p t t t t p d H d I t l p d p t p ss  
b t ee t p d l bo Th d bl t f 1 2 d  
3 h w th m g d L d A h d p l l y ca ry g th  
gh E d tl th b d th h f p th h d

at the F fth Avenue Hospital with a subcoracoid dislocation of the left humerus su tained half an hour previously in an automobile acc dent

The patient was in moderate shock and had other minor injury. He was of spare physique. The dislocation was reduced easily without anesthesia and the patient placed immediately in traction suspension (Fig 346). Subsequent x ray showed that the dislocation had been reduced and the greater tuberosity of the humerus to have been fractured and but slightly separated (Fig 347).

The traction suspension was maintained for ten days during which time the patient was encouraged to exercise voluntarily the elbow wrist hand and shoulder in every direction (Fig 347). The only restriction placed on movement was that abduction

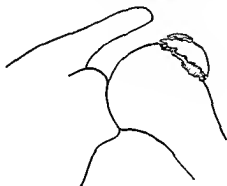


Fig 34 — Right shoulder dislocation

at the shoulder should not be attempted beyond the angle of 90 degrees. At the end of ten days he was removed from the apparatus and allowed up. Active exercise of the shoulder was encouraged utilizing various methods of enforcing active motion. He was discharged from the hospital on November 24th, three weeks after injury, having remained without the traction period in order to secure his physiotherapy more easily.

On examination eight weeks after the original injury, active extension was possible to within 10 degrees of normal at the shoulder and abduction to within 15 degrees of normal. There was no interference with function in the wrist or elbow; the grip was strong although there was no appreciable atrophy in the

arm. The only time the patient feels badly is when he attempts motion beyond the limits herein quoted.

**Comment**—In reducing recent anterior dislocations of the shoulder there is frequently no need of anesthesia provided two points are kept in mind. One is that all manipulation must be gentle and practically painless. The other is that the chief effective maneuver in the Kocher or any other reduction is steady firm traction. In regard to the first point the administration of 5 gr of morphin and the refraining from any sudden violent or jerky movements will cover the situation. In regard to the second reduction methods in these cases are frequently practised as a series of movements more or less violent with relatively little traction.

In practice it becomes apparent that the essential feature of all methods in these early cases is traction. This should be made with the arm alongside the body and should be steady uninterrupted and firm. If this is maintained with counter traction in the axilla by an assistant or by the use of a sheet looped through the axilla and attached to the head of the bed and gentle rotatory movements practised not before the traction has been steadily maintained for at least three or better five minutes reduction may frequently be accomplished without any further movement. When this is not the case at the end of five minutes traction the movements of the Kocher reduction may be gone through slowly and gently without any interruption in traction to effect reduction. If this is not effective an anesthetic should be administered and the same slow steady gentle method pursued. There is no indication under any circumstances for rapid violent movements in the reduction of a shoulder dislocation.

In any violent attempts at reduction we are commonly apt to do more damage than did the original injury, an accomplishment which we cannot view with much satisfaction even if it does result in a pleasing x-ray print.

Following the reduction of a dislocated shoulder active movement if possible will of course greatly shorten the convalescence and increase the possible ultimate functional result.

Particularly is this true in a man fifty three years of age in this case in addition to the dislocation the greater tube of the humerus was fractured and slightly separated. This is the type of case in which early active mobilization—meaning by this the use of the part by the active and voluntary functioning of the patient's muscles within pain limits—results in a shortened convalescence and in secured functional end results. If following reduction we had put this man in a sling or a body swathe for a week ten days two weeks or longer as is frequently done we should have had more difficult convalescence a lower convalescence and it is doubtful if he would have secured eventually the end results which he shows now at eight weeks.

In using traction suspension we are counterbalancing the weight of the extremity so that the muscle movement need accomplish only the movement on the joint surface the weight being lifted being taken care of by the counterbalance in suspension weight. In addition by the use of moderate traction in abduction we are separating the joint surface of the injured shoulder. This is very important because it is a well recognized fact that in inflamed joints the separation of the joint surface by moderate traction results in a remarkable diminution of pain and relieves the muscle spasm which tends to make movement a difficult process. The effect is so marked that for a long time I have used traction in the treatment of all inflammatory joint conditions purely for the relief of pain and spasm it being often more effective than drugs in this respect.

By the use of traction suspension therefore make movement relatively painless and mechanically easy for the patient. At the end of forty eight hours this patient is able to bring the arm voluntarily into the full adduction and into abduction without marked discomfort. Elbow is straight and in line movement were full range and without a visible motion. The only movement which caused particular pain was extreme rotation of the upper arm. This was due to the fact of the great tuberosity with its muscular attachment.

Putting up a patient in this type of apparatus the high

active movement in all directions is possible; not active mobilization no matter how mechanically perfect the apparatus may be. I shall refer in the next case to a therapeutic conception of a fracture and I shall start off by saying that a fracture is an injury to a part of an *individual's* body and it is this factor of the individual which we must take into consideration in any treatment which calls for active mobilization. That is to say the patient must not only be placed in a position where he can actively use the part but that it is part of the doctor's duty to see that the movement is carried on at very frequent intervals and in the proper range and direction.

The only restriction which was placed on this patient was that he might not abduct the arm beyond 90 degrees for the first week in order that redislocation might not occur in further abduction until the capsular tear healed. He was seen frequently every day and made to move the arm in all directions *within pain limits*. He was not encouraged to go beyond pain limits nor was he encouraged to go through any prolonged period of exercise at any one time. Pain causes muscle spasm with resultant limitation of motion while prolonged attempts at exercise cause fatigue with secondary soreness and limitation of motion. Frequent short periods of exercise within pain limits constitute the proper procedure. In addition the patient must be shown how to move the part and not merely told to move it. He is very apt if simply told to move the extremity to go through a number of motions which he believes are exercising the affected joint. In reality they exercise the joints nearby. This is particularly true in the shoulder where scapular motion is frequently confused in a patient's mind with shoulder joint motion.

Different patients will have to be approached in different ways in order to secure active co-operation. Some must be browbeaten, some can be reasoned with, some can be cajoled. It is part of the doctor's task to ascertain which method is necessary and employ it. There are patients from whom active co-operation simply cannot be secured. This may be due to the patient's particular make-up or it may be due to our lack



of understanding of his psychology. In either event the method of treatment is a very poor method for that type of patient. It constitutes merely a gesture and the patient would be much better off out of bed with his arm at his side in a sling.

During the time the patient is in traction suspension heat, light massage and other physiotherapeutic measures may be carried out. Active mobilization is extremely effective in the case in securing rapid and efficient results only provided the doctor is willing to take the time and trouble to make it amount to more than a gesture.

Had this patient sustained merely the greater tuberosity fracture without dislocation of the shoulder the treatment called for would have been identical. The value of traction and counterbalance in inducing functional activity of these parts is excellently illustrated by the patient taken out of the apparatus. Where he has had while in the apparatus a ten degree range of easy motion without pain when you get him up with the weight of the arm supported in a sling but with joint surfaces apposed and with muscular activity now forced not only to move the joints but in so doing to lift the weight of the part the range of movement becomes restricted and is painful within narrow limits. If it can be done I feel it is better to keep a case of this sort in traction suspension under active mobilization as described for a period of three weeks before allowing the patient out of bed with the arm free.

## FRACTURE OF THE CLAVICLE

**Case History**—Child J B age ten and one half years male No 31752 admitted to the Surgical Service of Dr F W Bancroft at the Fifth Avenue Hospital December 27 1927 with a history of having fallen on the outstretched right hand shortly before admission sustaining injury to the right shoulder region which gave pain and renders the arm useless

**Physical Findings**—Irrelevant except for local condition The note on this states There is a fracture at the junction



Fig 348—x R y t g g l p o t C mp with Fig 3 6

of the middle and outer thirds of the right clavicle with inch overridin The inner fragment lies above and in front

A T splint made of padded basswood was applied and the patient was up and about the ward until January 14 1928 when he was discharged to the outpatient department wearing the splint under his regular clothing

He returned to the outpatient department on January 18 1928 three weeks after injury at which time his splint was removed and he returned to normal life with perfect function and without further treatment

**Comment**—There are several points worthy of comment in this case in regard to the general principles to be employed in

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## FRACTURE OF THE CLAVICLE

**Case History**—Child J B age ten and one half years male No 3157 admitted to the Surgical Service of Dr F W Bancroft at the Fifth Avenue Hospital December 27 1927 with a history of having fallen on the outstretched right hand shortly before admission sustaining injury to the right shoulder region which gives pain and renders the arm useless

**Physical Findings**—Irrelevant except for local condition The note on this states There is a fracture at the junction



Fig 348—\* R y t g g l p o t n Comp with Fig 356

of the middle and outer thirds of the right clavicle with inch overriding. The inner fragment lies above and in front.

A T splint made of padded basswood was applied and the patient was up and about the ward until January 14 1928 when he was discharged to the outpatient department wearing the splint under his regular clothing.

He returned to the outpatient department on January 18 1928 three weeks after injury at which time his splint was removed and he returned to normal life with perfect function and without further treatment.

**Comment**—There are several points worthy of comment in this case in regard to the general principles to be employed in

fracture treatment Here is a child who has a fracture of the clavicle and as may be seen by the tracing of x ray plates (Fig 348) displacement of the fragments An apparatus is applied which offers no interruption to the continuous functional use of the arm which use in fact is actively encouraged In



Fig 349—The child patient with clavicle fracture and displacement

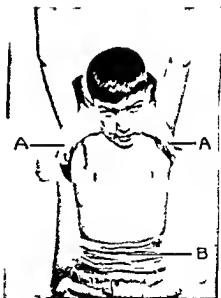


Fig 350—The child patient with clavicle fracture and displacement after treatment

add to the child's up and about movement and taking full care of him. If a delay of a few weeks his treatment could be perfect from atrophy and but light temporary treatment. There is no need for bracing or sagging bathers etc.



Fig 351—L t l N t h w h ld h ld b k A ll y  
 th (A) b dy th (B) d g f m t It y t lso  
 th t by d p p l ry d b d l pl t m fn t t  
 d m mf t bl ppl t ca b cu l

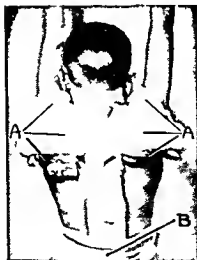


Fig 352—N t ll y h (A) d body th (B) th l l f  
 th b d g f m t I th l m m pl t h east d b d  
 th h ld f h fl t d d b sed

Suppose we had treated this boy by some form of corrective and immobilizing apparatus such as the Sayre dressing or the Velpeau. The lump which you see on his clavicle (Fig 355) would be smaller possibly but for that gain we would have to spend some weeks more in losing up a stiffened shoulder—and in so doing we would be treating in the shoulder and elbow



Fig 33—The how to get the neck in the first place

joints and the surrounding activated muscle and the circulation of the extremities in the patient's injury but the harmful results of our attempt to treat the bone. During the time any such apparatus was applied the patient would be essentially a completely immobilized and much more uncomfortable than this boy. He played street football while wearing this

splint. Normal anatomy in this child's lesion was not an integral and essential factor in function. The lump on his clavicle—visible now—will be unnoticeable within a year's time.

We have followed in the treatment of this case several general principles of fracture treatment. In the first place we have regarded a fracture *from a therapeutic standpoint* as



Fig. 354.—Radiograph of the clavicle showing a fracture.

an injury to a part of an individual's body in which the bone happens to be involved. This viewpoint is quite different in its effect on choice of treatment from that of regarding a fracture as a solution of continuity in a bone.

In the second place, where anatomy is not intimately concerned with function, and in order to regain and maintain normal anatomy we would have to interfere with or endanger the



ultimate return of function or the rapidity of return anatomy has been disregarded in order that rapid and perfect functional



Fig. 35—Showing method of holding patient in position for X-ray examination of the shoulder joint.



Fig. 36—Ray's method of securing position for X-ray examination of the shoulder joint.

return may be secured (Fig. 356). In the case of the shoulder joint, the use of the apparatus—excluding the one used in the case of the hip—will retain normal anatomy in many of the cases in which it is indicated.

unless it interfere with function. I have used and still use a refinement of the T splint with a spinal curve a sacral base plate and an adjustable cross piece to raise the affected shoulder after the shoulders have been pulled back. This is mechanically more effective in improving position and probably more comfortable.

A few years ago I showed at the New York Academy of Medicine a simultaneous fracture of both clavicles with displacement wearing the latter splint. Within four days after

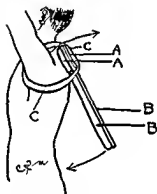


Fig 35 — Method of applying the splint and the method of showing the position of the clavicle after fracture. The splint is applied to the clavicle and the arm is pulled back. The splint is then adjusted to the position of the clavicle. The splint is then applied to the clavicle and the arm is pulled back. The splint is then adjusted to the position of the clavicle.

the application the adult of the twenty-two year was wearing his ordinary clothes over the apparatus was able to comb his hair have food and dress himself. At the end of five weeks he had almost normal function in both arms and at the end of ten weeks was back at his work handling sides of beef.

There are a few points in the application of this type of splint which are essential to its proper working. The idea is to keep the fragments from any extended movement and to correct the position as much as is possible without interfering

with full function. The splint is applied with the arms of the patient abducted, the one on the injured side being supported and the cross piece well padded is applied in the plane of the normal upward slope of the back above the scapular spine (Fig. 351). The two circular swathe well padded are then

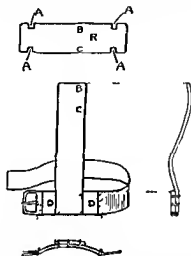


Fig. 358—A, the splint; B, the cross piece; C, the padding; D, the band. The splint is applied with the arms of the patient abducted, the one on the injured side being supported and the cross piece well padded is applied in the plane of the normal upward slope of the back above the scapular spine (Fig. 351). The two circular swathe well padded are then

snugly applied about the end of the rib cage and the humerus and then over the axilla. The lower end of the vertical bar well padded is then carried in to the upper end of the sacrum drawing the shoulders back and the body swathe applied (Figs. 350-352). The arms are then let down. In the aluminum splint which I have here described the cross bar is then shifted to raise the affected shoulder (Fig. 358). In using the aluminum splint the axillary band are pieces of rubber

tubing not too elastic and well padded and the body swathe is the belt and buckle riveted to the sacral plate

When the body swathe is applied to the padded basswood crucifix it must be so applied that the patient cannot shift the lower end of the splint laterally. When the arms are first let down the pressure in the axilla may be bothersome and may cause engorgement. The patient is instructed to raise the arms to the head or in abduction at frequent interval for the first few days during which time adaptation to the pressure occurs.

Unless the patient specifically desire normal anatomy to receive attention at the possible expense of function I prefer this method of treatment in adults as well as in children. Even when such specific desire is expressed unless the patient is willing to follow one of the forms of bed treatment—Stimson, Couteaud or traction suspension—I believe that an open reduction and internal fixation followed by the use of this type of splint is the treatment method of choice.



## A CASE OF MULTIPLE FRACTURES AND DISLOCATIONS WITH A COMMENT ON THE USE OF RECTAL ANES- THESIA

A R male adult aged thirty six Case No 31133 admitted November 17 1927 with the following history

Five days before admission he fell four stories from a hotel window and was brought unconscious to another hospital by ambulance. He sustained a fracture bimalleolar of the left ankle with considerable displacement a crush fracture of the right astragalus fractures of the comminuted type of the upper end of both tibiae involving the knee joint with marked displacement a comminuted fracture of the upper right humerus with very marked displacement of the fragments and a fracture of the base of the skull. In addition he had apparently retroperitoneal hemorrhage as evidenced by abdominal distention flank tenderness and later ecchymosis with persistent vomit in. He was in extreme shock.

His fractures were very properly merely immobilized in view of his general condition the arm being put up in right angle traction and the left ankle and both knees in plaster of Paris. He was treated generally by external heat forced fluids including clysis elevation of the head of the bed on blocks sedatives and repeated lumbar puncture.

Five days passed before it was deemed possible for him to be moved. At that time he was brought to the Fifth Avenue Hospital. At the time of admission to this hospital he was conscious but disoriented as to time place and persons. He was extremely pale and weak and his pulse was 140. He was restless and talkative. Figs 359 to 362 represent the condition of his fractures at this time. It will be noted that the fracture into the left knee joint was accompanied by a dislocation of the knee due to apparent tearing of the lateral and crucial ligaments. It will be noted too that in the fracture of the right knee the tuber



as to be probably out of the joint. The crucial ligaments here must have been badly damaged. In the fracture of the upper end of the right humerus the head is split off at the anatomical neck and the greater tuberosity is split off from the shaft with marked displacement in each instance. There was ecchymosis about both mastoid. There was still abdominal distention, marked tenderness both anteriorly and in the flanks, a temperature of 101° F., marked tremor of the hands and marked restlessness. The mental symptoms persisted.

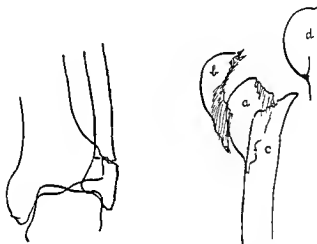


Fig. 361—Left humerus, fracture of the upper end.

Fig. 36—Right humerus, fracture of the upper end, showing the head and greater tuberosity.

For the four days during which the patient had been in the hospital of first admission the shoulder had been in traction suspension in a position of abduction and partial external rotation of the arm. During that time the position of the fragments had not improved. On the day of his admission to the Fifth Avenue Hospital he was still vomiting and his general condition was extremely poor. Apparently as the result of his retroperitoneal hemorrhage he was extremely pale and waxy. His restlessness and noisiness were controlled with



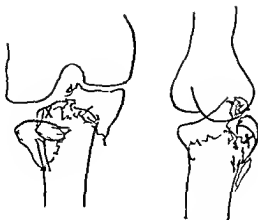


Fig. 359—Anterior-posterior and lateral diagrams of right knee before treatment. X represents displaced posterior fragment.



Fig. 360—Anterior-posterior view of right knee before treatment. X indicates location. Anterior-posterior view as lateral view of distal femur.

ossities are split by the penetrating shaft fragment and that part of the articular surface is displaced posteriorly so extensively

was administered by Dr Gwathmey. A transfusion of 500 c c of whole blood was given by the Unger method by Dr Thompson. A steel pin of the jointed type was pushed through the shaft of the right tibia about 4 inches below the knee joint. A second steel pin of the same type was pushed through the shaft of the right femur just above the flare of the condyles. A Thomas splint with an attached Person foot piece was applied to the right leg and 35 pound of traction was applied to the tibial

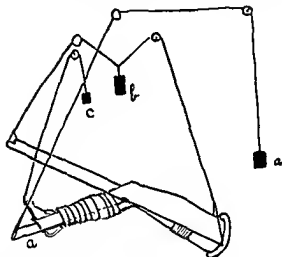


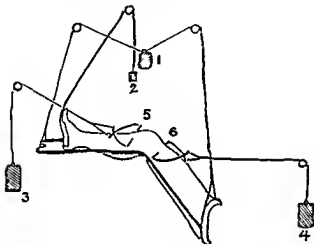
Fig 364—Sub pop t f l ft l g l l t pl t (see Fig 365)  
 kl l g b d g d t P l g p ( ) t b l d by w ght  
 Th m pl t pe d d by t l l g ght b F t t t t  
 b d t b l g w ght t b t f d p

pin and 35 pound of countertraction to the femoral pin utilizing a Balkin frame and arranging the lever in the foot piece to allow active motion at the knee.

The fracture of the left ankle was reduced by manipulation and splints of the Stimon type of molded plaster were applied. A Thomas splint was applied to the left lower extremity with an attached Person foot piece to allow of active mobilization. The upper humerus fracture was reduced as far as possible by

difficultly by edata e fluid were forced by e ery po ble means and the general treatment before de cribed was conti ued

After four days under thi routine hi gene l co d t on had mp oved to a po nt whe e he was much quieter and hi pul-e w s remaining around 104 He w still pale and weak a d wa apparently a very ery poor n k for th p ocedu hich would ob ou ly be necess ry n o de to attempt any correct:



Fg 363—T h p d t (3 p e d h) sed  
ght knee f ru l g be Th m pl t f pe l p  
se t eght ) t flex t co bal ee gh f l g hgh d th  
pe dung pl 2 foot fi t keep foot d fl 3  
d 4 ar 3 po d t d r ght 5 16 p  
th gh t b d fib l pect el P so l g pec p d

oi hi name ou d format e On th th hand both h nd  
h family we ry nxi u to g t a d f n t al ult  
s po bl a th p tient n rm ll ery cti man and  
was n fact equ d to b so h h b e nt st

After c reful n d l at d I mu t adm t w th m  
he t n v a r n e m e t we m d o \ m t 21 t the  
fou th day fter adm i n t th Fith A u H pit l t  
tt mpt < m e t e t m e t f r th f tu l l n th n

short intervals within pain limits during that time. In addition baking and some light massage were used during this period. Active mobilization as described with baking and light massage was instituted on the left knee from the beginning and was maintained for one week by which time much of the infiltration of the soft part edema pain and tenderness had disappeared.

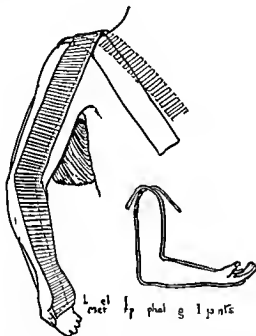


Fig. 366—Shows the dislocation of the knee joint and the fracture of the femur and tibia. The femur is fractured in two places, the middle segment being displaced upwards and backwards. The tibia and fibula are also fractured, the tibia being displaced forward. The foot is shown in a pronated position.

Under a short chloroform anesthesia the dislocation of the knee was then reduced and the knee immobilized for three weeks in circular plaster. Following the removal of the pins two weeks after the reinsertion an attempt was made under a short chloroform anesthesia to secure better reduction of the tibial fragments particularly of the fragment displaced posteriorly which was palpable apparently beneath the skin. Fol-

manipulation and immobilized in partial abduction using molded plaster splints with the forearm in full supination the elbow in flexion and the upper arm in moderate outward rotation. The molded plaster included a double shoulder cap. (For description of the apparatus and splints used see Figs 363-366.)

The whole procedure including the complete application of the different pieces of apparatus took three and one half hours. The patient's pulse at the start was 104. When the procedure was ended it was 108. The patient's condition was better if

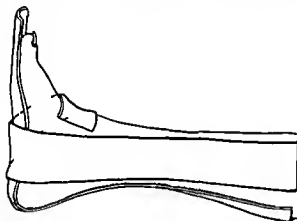


Fig. 365—Splint for the elbow—molded plaster—position of the forearm in moderate outward rotation—this so-called S. Mayo splint.

anything probably as a result of the transfusion. The patient to the procedure was started. A small amount of chloroform anesthetic was used throughout when the patient was actually driven through the bone. The shoulder was kept in plaster for six months and then started on active mobilization. The ankle was kept in plaster for approximately the same time followed by active mobilization. The patient was maintained at its initial weight for four days and then reduced to 70 pounds in each direction. This was maintained for two weeks. The patient actually uses the knee frequently.

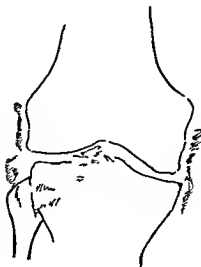


Fig 368—L ft k d h g C mpa th Fig 360 N t l ficat  
t l g m t

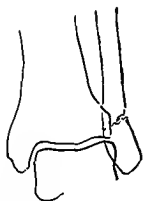


Fig 369—L ft M d h g  
C mp w th Fig 361



Fig 370—b h g gl t h l  
d t t m f d sch g H d  
h ft d t be ty ly g t d  
d b y d h d d t d t  
h ft

Following this manipulation the knee was immobilized in circular plaster for a period of three weeks after which the plaster was removed. Following the removal of the circular plaster active immobilization was again instituted on both knees.

During this entire time both kinesthetic and active mobilization of all parts that were available were practised daily. At the end of eight weeks the patient left the hospital to return to his home in Chicago for further convalescence. At that time

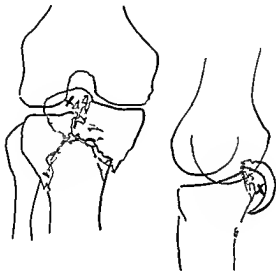


Fig. 36 — Right knee, showing cast immobilization. Fig. 359 — Left knee, showing cast immobilization.

he was sitting in a chair and the patient of the day went about a wheelchair had almost full extension of both knees could lift both feet high off the bed or floor without pain in position could flex the knees about 50 degrees without pain had full function of the ankle and could bend the arm at an angle of about 45 degrees from the body before all the capital movement into place. It was yet too early to permit the use of crutches with weight bearing because of the unfortunate fact

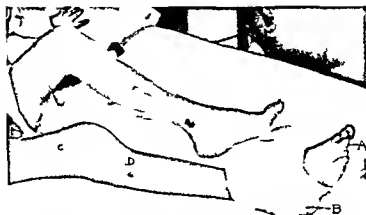


Fig 33—Sh g ft poss bl l f l g h h both k d  
 kl f t p set d wh h k w d l cat d d et t  
 g l l g m t Th t d d b k d d pl m t f th l  
 t b l f g t th g h l g h g l y pp t (C mp t l f l  
 y f th l g) A d B h w p f l k g g l t g l  
 soft p t m t h h p t l l h l d C d D t h l d  
 p l



Fig 34—Lat l w f both l g f g pp

The t ay t acin<sub>g</sub>s here shown with their appended de  
 cript n will illustrate the results gained in the actual reduction  
 of anatomic deform ty (Figs 367 to 370) I m ht say that the





Fig 31—Less t t m f d scharg h g gr ss ppe



Fig 32—Sh g fl so poss bl m ght l g m l d sch g d  
h l d p d ( d b) \ l t ly mal fpe fl d  
po so C mpo h m l g Fig 33

that both l es w re ff ted nd th l rg mount f all  
probably not fully c nsol dat d to st nd the w ght

on the postero-external aspect of the knee which comprise part of the articular surface of the tibia and which presumably lie at least partially without the joint may have to be removed. This will be however a relatively minor procedure and I doubt very much whether it will be necessary.<sup>1</sup>

In the reduction of the shoulder an interesting point was illustrated one which has been stressed by Blake. This is that in reducing fractures of the neck of the humerus in which displacement has occurred the shaft riding up above the lower end of the head fragment in order to secure reduction either by traction suspension method or by direct manipulation traction must be made with the arm in adduction across the front of the chest until reduction is secured. Traction in abduction which is frequently used is ineffective or at least reduction is so accomplished only as the result of great violence. The palpable explanation is that in the adducted position the pectoral muscles are completely relaxed similar to the relaxation of the gastrocnemii and the ham string when the flexed knee is used while reducing leg fracture. This is a fact I do not believe is generally accorded practical recognition. When the reduction has been accomplished and the fragments are in contact the arm may be brought gradually into abduction for immobilization or further traction suspension the abducted position being the best position for the immobilization.

I M 1928 the patient has dislocated the right shoulder. The patient is a 35-year-old male, a heavy worker, who fell from a height of 20 feet. The patient was brought to the hospital by ambulance. The patient was found lying on the ground with the right arm hanging by his side. The patient was conscious and in good health. The patient was taken to the hospital and the right shoulder was examined. The patient was found to have a dislocation of the right shoulder. The patient was taken to the operating room and the dislocation was reduced. The patient was then immobilized in a cast. The patient was discharged from the hospital on the third day. The patient was followed up for six months and the shoulder was found to be in good health.

left knee in which the lateral ligament were torn and now quite stable and show in the extended position only very slight lateral mobility. The gross appearance of the limb is shown in Figs. 341-344.

Comment—The first feature of the case on which to comment is a main one of the general principles of future treatment—that the individual require attention as well as the fracture. For a period of approximately one day the patient's general condition occupied the therapeutic limit to the exclusion of any more attention to his fracture than the actual prevention by immobilization of further damage. Also the soft parts insofar as was possible were protected by elevation, heat and massage on the general principle that they were quite as important as the bone lesion.

The next point for comment is the use of rectal anesthesia. I am quite convinced that in this case it would have been utterly impossible under a general anesthesia to have manipulated an extensive fracture a week old, multiple with marked displacement and in addition to have inserted pins through the femur and the tibia. The operation might have been successful but the patient would not have survived.

I feel that colonic anesthesia in competent hands is a life saver to the surgeon in these cases of multiple injuries in such badly shocked patients.

The traction and suspension technique mobilization, the treatment of the soft parts combined with the treatment of the bone lesions and meticulous attention to detail are possible for going to this man a useful arm and shoulder and feet, which sprang practically normal in appearance and a right leg which hit the wall some backward and toward displacement of the femur and the tibia due to lateral position of the popliteal fragment of the tibia (extension) and a perfectly useful leg and not a mangled remnant of the distal end of the popliteal. Motion in the joints will undoubtedly be maintained with treatment in which the patient's cooperation must be maintained to an extent where better than right leg is so may be said.

There is a possibility that the markedly displaced fragment

## AN IMPROVED METHOD IN THE USE OF STEINMAN PIN FOR TRACTION

THERE can be no dispute but that the most efficient form of traction from a purely mechanical standpoint is the use of skeletal traction in some form. As between pin and tongs in the application of skeletal traction the most efficient mechanically is unquestionably pin. This is because the pin is more firmly fixed in the bone allowing better control of the fragment to which it is attached than does the tong which is pivoted on or in the surface of the bone with little or no penetration. It would seem therefore that all other things being equal pin traction would be the method of choice where traction is indicated. Certainly in the general application of traction this is not true.

The reasons given for the employment of less efficient forms of traction in preference to the use of the pin are commonly (1) fear of infection in the depths of the bone by the penetrating pin (2) infection in the soft parts (3) persistent discharging sinuses after the removal of the pin in the absence of gross infection and (4) in certain cases particularly where used in children injury to nearby joints from slipping or cutting of the pin.

These objections can be removed by the use of proper surgical technic proper mechanical application of the pin and suitable dressing of the pin wound.

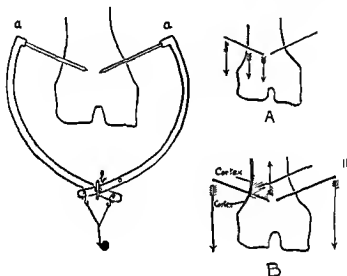
When the pin was first introduced by Codivilla and its application later elaborated by Steinman it was commonly driven completely through the bone with traction applied to the projecting end. It is still frequently employed in this manner.

The chief objection to this method of using the pin is that in its removal it must be withdrawn from one side the obviously unsterile end which has been projecting from the opposite



be withdrawn from either side without passing contaminated metal through the bone. The penetration of the bone is not complete and all the effects of the pin previously described are felt only in part of the bone.

Theoretically when the traction tongs are applied to the end of the Steinman pins when two are used the point  $z$  is



Fg 376—P t d b—th t cally f d p t w th t m  
 t lf th t th ff t f th p ll ld b A A t ll  
 th mo m t t th se p t d th ff t f th p ll B th  
 h d rt t g f l m f l d t t t d cy d l p g  
 d gr m d th h d l p se t th p d l  
 p blt m m m Th pp l g b ca f soft ca llo  
 t f bo th l w t b ca se f h d t t t f  
 t Th ma k f l m

a fixed point and the point *b* at which the set crew lie a fixed point. Actually this is not so. There is some movement at both the *e* points. If these points were fixed the pull of the pin might be diagrammed as shown in Fig 376 *A* and its effects be those therein explained. With movement at the *e* points however the actual condition is as figures in Fig 376 *B* and as described in the explanation given theewith. The larger part

side being pulled through the bone. It is difficult to sterilize this end efficiently before it is pulled through the tissues. This disadvantage was met by a pin screw jointed in the middle but with impairment of the strength of the pin. There is an addition on the following objection (Fig. 375). When traction is made on a pin so placed the total effect of the pressure of such traction is exerted on the distal surface of the pin against the underlying bone. This results in a certain amount of pressure necrosis. What is more important is that beneath this area of pressure necrosis is an area of dead bone density comparable to the fibrosis which occurs in soft parts about a point of persistent pressure.

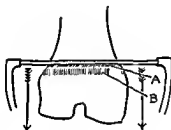


Fig. 375—Pin secured through bone. Traction is applied to the distal end of the pin. The pressure is exerted on the distal surface of the pin against the underlying bone. This results in a certain amount of pressure necrosis. What is more important is that beneath this area of pressure necrosis is an area of dead bone density comparable to the fibrosis which occurs in soft parts about a point of persistent pressure.

In the presence of pressure necrosis the infection of our much more apt to occur than in normal tissue. The increased bone density beneath the tendon the handling of infection by the body forces is sufficient due to the dense accumulation and in addition to render the healing of the cavity made by the passage of the pin quite slow due to the mechanical injury to the bone. Even in the absence of infection the low healing will allow of a further persistent injury when the pin is withdrawn.

Some time later the use of the double pin—open pin is derived from the idea—was substituted as seen in Fig. 376. This has the advantage over the previous method in that the pin may

no effect insofar as necrosis or bone sclerosis from pressure is concerned. The tendency for such a pin would be immediately to pull out. Somewhere between the position shown in Fig 376 and that shown in Fig 378 we have a position in which the pin will stay in place with a minimum of necrosis and pressure sclerosis.

Experimenting with this problem over a period of some years I have found that if pins are inserted from either side at an angle of approximately 45 degrees with the horizontal as

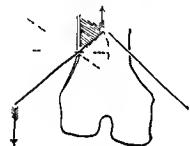


Fig 379—Shows the formation of the pins in the bone. The pins are inserted from the sides at an angle of approximately 45 degrees with the horizontal as shown in Fig 376 and that shown in Fig 378 we have a position in which the pin will stay in place with a minimum of necrosis and pressure sclerosis.



Fig 380—Shows the why the pins stay in place. The pins are inserted from the sides at an angle of approximately 45 degrees with the horizontal as shown in Fig 376 and that shown in Fig 378 we have a position in which the pin will stay in place with a minimum of necrosis and pressure sclerosis.

shown in Fig 379 they will not pull out even under heavy traction and there is a minimum of damage to the bone by pressure and sclerosis so that when the pins are removed even after they have been in for weeks x ray pictures taken in so short a period as ten days after the removal give little or no evidence except on the cortex of their having been in place and the soft part wounds heal in two or three days.

The explanation of this is twofold and is dependent upon the relative difference in the pressure necrosis in the cortex and in the cancellous bone for the effects of which see Fig 380 as well



of the pull of this method of application is as in the previous case directly in the line of traction but we have now a double line of bone necrosis with bone sclerosis beneath and above the pin. At the hard cortex of the bone we have a minimal amount of necrosis. On the surface of the pin away from the direction of traction we have a more extensive necrosis and underlying sclerosis due to the fact that the cortex is much more resistant than is the cancellous bone lying beneath it. The tendency in this case is for the pin to assume the position shown in Fig 377

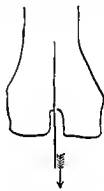
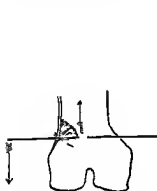


Fig 377—Shows the position of the pin after traction. The pin is angled upwards and to the right. The bone is shown in cross-section with a central cavity. The pin is inserted into the bone and the direction of traction is indicated by a vertical arrow pointing downwards.

Fig 378—Shows the position of the pin after traction. The pin is angled downwards and to the right. The bone is shown in cross-section with a central cavity. The pin is inserted into the bone and the direction of traction is indicated by a vertical arrow pointing downwards.

The necrosis in this case is just as extensive although it does not extend completely through the bone.

Obviously by placing the pin originally as shown in Fig 377 the necrosis which occurs because of the pin's position in the bone is the position as in Fig 376. It is angled but from the position shown in Fig 377 the same tendency to rotation with the fulcrum of the lever lying in the cortex on the bone as shown in Fig 376 is present as we show in Fig 377.

If we consider Fig 378 for a moment it is apparent that a pin inserted in the axis of the tract could exert practically

of the soft parts. This factor can be obviated very readily if the procedure shown in Fig 382 A is always employed. The traction on the soft parts away from the line of pull there shown is exerted continuously by an assistant until the pins are completely placed. When that traction is released we have the condition shown in Fig 382 B with a minimal chance of pressure necrosis in the soft parts.

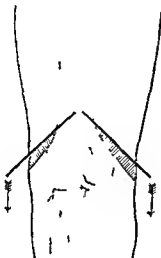


Fig 381 —b h g p t d w t h f t p t mal p o t  
 Sh d d p t f soft p t p ss wh p ll ppl d d  
 t f w Th m t wh p p t h w  
 Fig 376 d 377

The third factor that of the manner of dressing tongue or pin wounds has an important bearing on the occurrence of infection. If the wounds are dressed by ordinary surgical dressings held in place by bandage or adhesive we have the condition shown in Fig 383 with the skin surface and the entrance of the tongue hidden from view. Unless we wish to take it for granted that we are surgically perfect and have had no pressure necrosis and no possible infection from the deeper layers of the skin it is necessary to inspect these wounds at

as to the diminution in the total amount of pressure necrosis and pressure sclerosis as shown in Fig. 3/9. The total amount of traction exerted in the bone end is somewhat diminished by the use of the pin as the traction is not all exerted in the direct pull on the lower fragment as was the case in Fig. 3/5. Even with increased weight the rapidity of healing is definitely increased by the use of the pin. There are still three factors to consider however in order to remove other objections to the use of pin traction.

Infection or persistent sinus as well as pressure necrosis of the soft parts encouraging infection which may extend to the bone may still result from poor surgical technique. I feel that a third factor which frequently accomplishes infection particularly in the presence of soft part pressure necrosis is the method of dressing the pin wound.

To deal with the first factor the insertion of pins for traction purposes must be attended with the same meticulous surgical technique that one would employ in an open operation on the knee joint or any other operation of similar nature and importance.

Too commonly the insertion of a pin is treated as a minor surgical procedure done with the patient in bed and with hardly more care in technique than would be employed in the graining of hypodermic. This is a very common mistake and results in frequent mishap. The use of meticulous technique in the insertion of the pin cannot be too greatly emphasized.

As to the second factor that of pressure in the soft part if pins are inserted with the patient in their normal position (Fig. 381) and on a flat table extending in the pins and the resultant tendency as shown in the figure of pressure to the plantar surface of the foot in the direct line of the traction pull. This results in some degree of pressure necrosis of the soft parts directly with the amount of traction and the tendency. Furthermore the absence of infection through the pin produces a dead chamber and a local infection under the skin in the presence of the pressure necrosis. This is not to be introduced from the animal in the leg of the lower of the knee but of the decrease in the rate

with the possibility of some infection which may or may not be able to take root depending upon the local powers of combat that infection. It is partly on this principle that Orr recommends his method of treating osteomyelitis. What is more if we have a wound which is discharging to any degree whether because of bleeding or because of the thin discharge resultant on tissue necrosis dressings must be accomplished.

The ideal dressing therefore would seem to be one which would allow of constant inspection of the pin wound and the adjacent soft parts without disturbing the dressing. To accomplish our result it is necessary obviously that we have a practically non-discharging wound as a primary requisite. By the method of employing pins I have described to minimize soft part and bone necrosis and by the actual insertion of the pins in the manner which I am about to describe the dry wound can be practically attained.

In inserting the pins through the soft parts the following procedure is employed. After the preparation of the skin by shaving after skin disinfection by whatever method is called for by the operator's surgical technique and the proper draping of the field the soft parts are put under tension by an assistant as shown in Fig. 382. Tension is maintained as described until the pins are firmly in place. If local anesthesia is used a small bleb of novocain is raised on the skin at the point for the external site of the pin and a skin nick through the skin only and not through the subcutaneous tissues and not more than 1/4 inch in length is made using a different scalpel for the two sides. Such a small skin nick provided it does not go into the deeper tissues occasions practically no bleeding beyond a slight temporary ooze. No further incisions than this are made.

Local anesthetic using a long needle is now injected along the oblique path which the pin is to take down to the periosteum (Fig. 384). The needle is pushed through the periosteum until it hits the bony obstruction of the cortex and the periosteum is injected. The pin is then inserted in the skin nick in the direction of the tract and is pushed down to the bone along it. It is

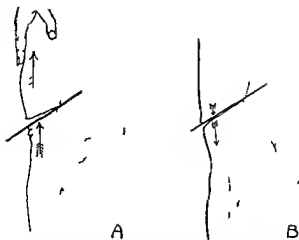


Fig 38 —Sh g an A th e h tss hld p d t  
 hl p being sort d th p f th p ard pl mes ga t  
 th l rf ce f th p b klung th tss and t dngt p l tss  
 yf m ppe p f l B th p an and p ss h b  
 lea d th m l l cty f th soft p rt wt d t p l th tss  
 yf h l p f d th l t l p ssu f m th pin

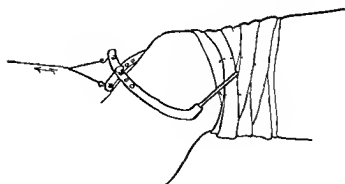


Fig 383 —Sh ang h w dm ry d g h d f p se d  
 q es d bl h d g f d g S h d g t gh

int rual Unless we are un e sonably sure of ur u gic l  
 techn c and of our skin condition v ry redress g is a oc ated



then forced into the bone surface preferably with a hammer with support on the opposite side of the limb through a sand bag and pressure by an assistant. The opposite pin is next inserted in the same manner and when both pins are in place tension on the soft parts is released as in Fig. 382 *B* and we have a wound which is bloodless a pin which is exerting a minimal amount of pressure on the soft parts and a minimal amount of pressure within the bone.

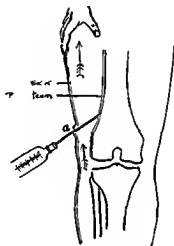


Fig. 384—Location of the pin in the tibia. The pin is inserted through the soft tissue and into the bone. The pin is held in place by a screw. The pin is held in place by a screw. The pin is held in place by a screw.

A very thin piece of sterile cotton of circular form 1 inch in diameter and about the thickness of a sheet of ordinary paper is cut prepared as shown in Fig. 385. It is spread out on the pin as shown in the figure in contact with the skin. The circular piece is glued to the skin with the collodion better still with a glue made of a saturated solution of x-ray film (from which the emulsion has been removed by heating) in acetone. In preference to the latter substance it does not loosen up so does collodion and because it is practically unaffected by

If we wish to employ the traction treatment in any form in accordance with that general principle of fracture treatment which states that a fracture should be reduced as soon after injury as possible we must employ it with the idea of securing a *rapid* reduction of our fracture within six to eight hours. This means the employment of relatively heavy weight running up to 60 pounds for this early traction reducing it then to weight just sufficient to maintain reduction. It is extremely difficult to secure such intensive traction by the use of skin strap unless multiple strap and multiple weights are employed as the skin in the average case will not bear so severe a pull.

For the proper carrying out of this principle of early reduction some form of skeletal traction is valuable. The traction treatment by the use of moderate weight which attempts to reduce a fracture over a period of days or as one frequently sees over a period of weeks is intrinsically wrong and in conflict with the general principles of fracture treatment.

All other things being equal if the traction method is the best method for reduction in the particular case in hand gross reduction should be effected within six to eight hours. It may be that it is not with us a question of choice but that under the circumstance traction is the only method of treatment which for one reason or another we can employ. The situation under such circumstances is entirely different. Given a choice of method however unless reduction can be accomplished by traction as stated some other form of treatment is better employed.

Experimental work with an animal and practical experience show that slow reduction extending over days or weeks are accomplished only at the risk of delayed or non union and incomplete anatomical results. When gross reduction is accomplished by the primary application of heavy traction within the first six to eight hours such minor adjustments as may be necessary can readily be made under a short chloroform anesthesia as the patient lies in bed and the weight reduced to an amount sufficient to maintain the reduction thus attained. This necessary weight is often not more than 10 to 15 pounds even in fractured femurs.



point of application of the pins is in any way obscured by the lateral bars of the splint it can be raised above the level of those bars by making the supporting band taut or by inserting padding or a sand bag between those band and the extremity (Fig 386)

The Spanish windlass fixed traction remains in place until the patient is returned to his bed and the traction on the pins is completely applied and working. Pin traction used by this method—paying attention to all the points which have been emphasized—is an exceedingly efficient and safe method of

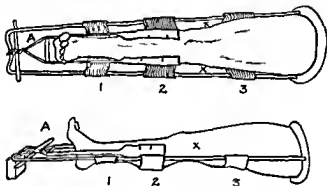


Fig 386—Leg fixed by pins and Spanish windlass method. The pins 1, 2 and 3 can be tightened or loosened by the windlass. The patient is placed in the splint and the pins are inserted into the leg. The windlass is attached to the pins and the traction is applied. The patient is then placed in the bed and the traction is maintained.

treatment if the proper patient is selected. It is particularly valuable in compound fractures and badly comminuted fractures.

All patients who are susceptible to pin traction treatment. The patient must be mentally and physically fit and willing to cooperate by the voluntary use of the joints which are made available by the employment of direct pull on the fragment of injured bone and the construction of which may make it possible to employ better treatment in the case must be considered before we can determine the future itself.

CLINIC OF DRS I LI GOLDSTEIN AND B S BARRINGER

FIFTH AVENUE HOSPITAL

## A CASE OF CARCINOMA OF AN UNDESCENDED TESTICLE WITH CEREBRAL METASTASIS

THE case here presented is instructive from several points of view (1) It offers a difficult problem in differential diagnosis (2) it illustrates the effect of radiation on testicular tumors (3) the cerebral metastasis is rare and presents a very interesting group of clinical manifestations and (4) it brings up the question of positive or doubtful spinal fluid Wassermann test in cases of brain tumor of non syphilitic origin

The patient H. B. a male thirty eight years of age when first seen on March 11 1927 complained of persistent headaches transitory attacks of aphasia weakness and impairment of memory

**Family History**—Essentially negative

**Past History**—Patient has been married twelve years His wife is in good health but has never been pregnant Syphilis and gonorrhea are denied His health was generally good until thirteen months ago when because of severe abdominal pains he was rushed to a hospital and operated upon He can throw no light upon the nature of this operation and unfortunately the surgeon did not keep a detailed record and has no pathologic report The surgeon states he found both testicles undescended with strangulation of the left testicle At operation the left testis was removed and the right was brought down into the inguinal canal His convalescence was uneventful and he was discharged cured

**Present Illness**—The patient states he never fully recovered strength following the operation About the time of his dis-

The fear that attend the use of skeletal traction by the doctor at large can be eliminated if all these facts are kept in mind. The mechanical effectiveness of the procedure plus the availability of all soft parts for physiotherapy and soft part treatment during bone healing plus the active mobilization of the joints made available by the use of this treatment can be used to secure more complete and more rapid recovery of both anatomy and function for the patient.

The difficulty that remains to be overcome is the fact that this method of treatment requires meticulous care, attention and supervision over a period of some weeks as compared with a reduction under an anesthetic is the application of some form of plaster and a masterly inactivity for a period of weeks.

The extra trouble, time and attention which this method entails as opposed to simple reduction and application of immobilization or operative reduction and immobilization is justified in our mind only if the patient benefits proportionately thereby. I am quite sure that he often benefits more than proportionately and I feel the effect that when it can be used on the proper patient under the proper circumstances and in the manner described the use of this method becomes a duty rather than a choice.

There are no changes referable to the other cranial nerves except the seventh. There is slight increase in the right palpebral fissure and slight lagging of the right eyebrow.

**Laboratory Data**—March 23 1927 *Blood* Hemoglobin 110 per cent red blood cells 5 500 000 white blood cells 12 400 polymorphonuclears 79 per cent lymphocytes 20 per cent eosinophiles 1 per cent *Urine* negative *Blood chemistry* urea nitrogen 13.3 uric acid 1.0 sugar 18 *Blood Wassermann* negative in both cholesterol and alcoholic antigens *Spinal fluid* cells 1 per cu mm globulin negative Wassermann—alcoholic antigen negative cholesterol antigen negative in 0.5 cc ++ in 2.0 cc Colloidal gold negative One week later another spinal fluid Wassermann test gave exactly similar results.

**x Ray Examinations**—March 22 1927 Stereo copic films of the skull by Dr Lewis Gregory Cole and Dr Robert E Pound in the lateral postero anterior and anteroposterior directions showed no evidence of abnormal bone changes no evidence of fracture no evidence of increased intracranial pressure and no calcification inside the skull.

March 23 1927 Films of the sella showed a very large sphenoid containing huge air cell. The sella was seen to be flat and the floor was pushed slightly upward by the sphenoid. The anteroposterior diameter of the sella was large in comparison with its depth but this could not—in the opinion of the roentgenologists—be considered the result of a pathologic process involving the sella itself.

A diagnosis of left cerebral neoplasm was made. On account of the positive Wassermann with the cholesterol antigen the patient was given the benefit of a course of silver salvarsan but without any effect upon his symptoms. As matter of fact his headaches and attacks of aphasia grew worse.

On June 2 1927 an encephalogram was done with doubtful results. Again the x ray of the skull showed no evidence of bone changes or of increased intracranial pressure. A lumbar puncture repeated at this time showed the spinal fluid as follows: Pressure 20 mm of mercury color normal globul

charge from the hospital he began to have frontal and vertex headaches which although mild at first became so sharp and constant within the last three months that he has been incapacitated from any work. The headaches are not accompanied by nausea or vomiting. His family has observed memory lapses and he himself complains of lack of initiative and of impairment of memory especially for his past.

Two months ago he began to have peculiar attacks characterized by transitory weakness and pallor with a fixed expression and complete aphasia. During these attacks which lasted from one to three minutes he remained fixed in whatever position the attack overtook him. The attacks have come on two or three times daily although several days have often elapsed without any. There were no convulsions or unusual movements of any kind. Usually he seemed that on awakening was aware of their having passed but there was also a state of complete ignorance of what had transpired. He recovered completely after each attack. There has been no loss in weight.

**Physical Examination**—A well developed and nourished man weighing 145 pounds. Heart and lungs normal. Blood pressure 130/80. Abdomen in both normal regions there is a scar about 3 inches long, box and parallel to Poupart's ligament. A small oedema about the size of a wrist and half in the right groin. Palpation of the stomach shows no tenderness.

**Neurological Status**—Appearance perfectly intelligent participation in the interview. Good attention good speech no changes in handwriting. No reflexes—biceps patellar patellar and Achilles—tendon and present on both sides with slight increase on the right. Biceps and Achilles—tendon present and quivering on both sides. No pathological reflexes. No sensory changes—touch pain vibration position sense intact.

Pupils equal 3 mm wide central rounded cut to light and darkness accommodates. No trabecular meshwork normal. Optic fundi both disks have moderate hyperemia. No immediate abnormalities in the fundi. Small hemorrhages.

the distal end of the inguinal scar on the right side is a large ovoid mass measuring 9 x 1 cm not attached to the skin extending into the scrotum and irregular in consistency.

**Neurologic Status**—The findings are the same as those mentioned in his original examination except that there is more marked weakness in the distribution of the lower branches of the right facial nerve. The aphasia is almost complete and an attempt to write his name is only partially successful. Visual and auditory perception unimpaired. The ground has no abnormal change.

**Laboratory Data**—*Blood Wassermann* negative in cholesterol and alcohol antigens. *Blood count* hemoglobin 104 per cent red blood cell 5 000 000 white blood cell 1000 polymorphonuclear cells 61 per cent lymphocytes 30 per cent mononuclear 3 per cent. *Urine* negative.

**X Ray Examination**—X Ray of the chest shows chronic peribronchial infiltration and no evidence of tuberculosis or metastasis.

**Treatment**—The hydrocele was aspirated and about 12 ounces of clear straw colored fluid were removed. The patient was then given an erythema dose of x ray over the inguinal mass. Two days after the x ray treatment the mass seemed much softer and smaller. During the next five weeks he was given two more erythema doses and although the tumor mass itself became softer the hydrocele kept growing larger. On March 24 1928 Dr B. S. Barringer operated under local anesthesia and found a large hydrocele sac with a tumor in the middle of it. The cord was absolutely free of the tumor and the entire mass was dissected out.

**Pathologic Report (Dr D. S. D. Jessup)**—An ovoid mass 9 x 1 cm showing smooth fibrous capsule. On section it is firm fibrous tissue with mottled yellow areas of necrosis. There are no firm zones suggestive of cartilage formation. Portions of the mass show considerable hemorrhage. *Microscopic examination* Section shows dense fibrous tissue in which there are nests of large cells with round or oval nuclei showing hyperchromatic change and many mitoses. Portion of the new

negative sugar 76.8 mg per 100 cc Wassermann negative in alcoholic and cholesterol antigens. During the ensuing two months the patient had several generalized convulsions. The attacks of aphasia became more frequent and the memory change more marked.

In August 1927 he consulted Dr C. E. Elsberg who diagnosed left cerebral neoplasm and performed an exploratory craniotomy. At the time of operation Dr Elsberg stated he could not see the tumor but could feel increased resistance to a probe. The fact he interpreted indicated the presence of a new growth. All that was accomplished at this operation was a decompression. The patient had an uneventful convalescence his headaches were much improved and after a period of several weeks practically disappeared.

It was considered advisable to give him x-ray therapy to the skull and during the next few months he received three courses of x-ray mounting to three skin doses. His general condition seemed good but his aphasia grew worse and about two months following the operation this became almost complete. At times he could not speak at all while at other times he could manage to say isolated words but understood everything that was said to him.

In September 1927 the tumor was thought to be enlarging and began to grow larger. Although it had slowly increased practically doubled in size in a period of four months. Subsequently its growth was very rapid and he felt weakness in the legs with a malocclusion complicated by the presence of a hydrocele.

On February 11, 1928 he was admitted to the Fifth Avenue Hospital presenting the following picture:

Physical Examination—General appearance is that of an elderly Irish white male thirty-nine years of age lying quietly bedridden with no apparent pain. Discomfort in the left parietal bone the area of a semicircular tumor. The result of his previous craniotomy. There is no tenderness and no bulging. There is an abundant growth of hair on the scalp. His mouth droops on the left side and pulled to the left. He talks. The tongue deviates to the left. Blood pressure 135/90. I

the distal end of the inguinal scar on the right side is a large ovoid mass measuring 9 x 1 cm not attached to the skin extending into the scrotum and irregular in consistency.

**Neurologic Status**—The findings are the same as those mentioned in his original examination except that there is more marked weakness in the distribution of the lower branches of the right facial nerve. The aphasia is almost complete and an attempt to write his name is only partially successful. Visual and auditory perception unimpaired. Eye ground shows no abnormal change.

**Laboratory Data**—*Blood Wassermann* negative in cholesterol and alcohol antigens. *Blood count* hemoglobin 104 per cent red blood cell 5 000 000 white blood cells 1000 polymorphonuclears 67 per cent lymphocytes 30 per cent mononuclears 3 per cent. *Urine* negative.

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growth are necrotic. At one point there are calcareous changes which appear to be in a vessel wall. Many of the small vessels show obliterative changes. *Diagnosis*—Carcinoma of testicle.

**Subsequent Course**—The patient recovered from the operation uneventfully and was discharged from the hospital on April 18th with the understanding that he was to have further x-ray treatment to his skull and abdomen. His neurologic symptoms had not materially changed during his residence in the hospital.

**Discussion**—**DR. ELI GOLDSTEIN**: 1. From the point of view of diagnosis the patient presents a very interesting problem. The following possibilities were considered:

(a) Cerebral neoplasm

(b) Syphilis

(c) Metastasis of the brain from a primary carcinoma of the testicle

The original finding pointed to a cerebral neoplasm localized in the left cerebral lobe. The positive Wassermann test in the chest indicated antineoplastic treatment on that occasion was indicated. However it is known that cerebral neoplasms will give positive or doubtful spinal fluid Wassermann readings in the absence of syphilis<sup>1</sup> and besides antineoplastic the prognosis was negative. Syphilis therefore was ruled out. The fact that the brain symptom commenced at the time of the patient's first operation for a supposedly strabulated left testicle would indicate that the pathological was already in existence in the right testicle at that time. It is not rare to find extensive metastasis from a very small primary lesion. Of course on questions whether the testicular tumor was bilateral. We have no objective evidence to prove this and furthermore bilateral testicular tumors are extremely rare. Hinman found 14 cases of bilateral testicular tumors in the entire literature and some of these were undoubtedly involve ment of the second testis by direct extension. Thus unless we assume that the adrenal glands with two distinct processes we must admit that this is a case of primary carcinoma of the right testis with subsequent slowly growing metastasis in the left cerebral hemisphere.

2. Ewing<sup>2</sup> is in favor of the teratoma as origin of testicular

tumors and states that the stroma duct cells interstitial cell and adult eminiferous tubules very rarely give rise to new growths. According to him all the common tumors and nearly all the rarer tumors of the testis arise from totipotent sex cells and the monodermal form are merely one sided developments of the original embryonal cells. He divide testicular tumors into three group

(a) Adult embryoma or teratoma

(b) Embryoid and mixed tumors

(c) Embryonal malignant tumors (which includes the type of carcinoma presented in this paper)

Testicular tumors metastasize in two ways (1) By way of the lymph channels involving the retroperitoneal nodes first and extending to the mediastinal or even cervical nodes. This is the more common channel of metastasis. (2) By way of the veins—giving metastases in the lung liver stomach kidneys brain and also in the long bones.

3 The question of the relative frequency of new growth in undescended as compared with scrotal testicle is an interest in one. Ewing states that undescended testicles are unusually prone to develop malignant tumors. According to Young and Davis the average incidence of undescended testicles varies between 0.1 and 0.2 per cent. It is a popular belief that the great majority of testicular tumor is to be found in cryptorchids but statistics do not verify this. Hinman finds 649 cases of testicular tumor reported but only 12.7 per cent of these are in undescended testicles. Of 3259 cases of undescended testicles reviewed by him there were only 6 tumors (0.18 per cent). Out of 182,729 general male hospital admissions the incidence of testicular tumor was 116 or 0.063 per cent. Of these three were in undescended testes that is one in about 60,000 admissions. Hinman concludes that testicular tumors are relatively more common in undescended than in normally placed organs.

4 Another point to be stressed is the relationship between the x-ray therapy to the skull and the brain symptoms. There is no question that following his craniotomy and the subse

quent x ray therapy there was marked improvement in the neurologic symptom excepting the increased and persistent aphasia. This is evidence perhaps that the radiation had some effect upon the tumor either partially destroying it or preventing its further development. The fact that there is no bulging in the craniotomy wound adds further proof to this point of view.

DR B S BARRINGER: When I first saw the patient he had the brain condition of which you have heard and a large tumor in the right groin. As no testicle was found in the right scrotum this was taken to be a tumor of the imperfectly descended right testicle. Above the tumor I could feel no metastasis particularly along the lines of the spermatic vessels—the course metastasis is likely to take.

We gave him what would be called a mild dose of deep x ray therapy over the tumor itself but not hitting the abdomen very much. I saw him from time to time afterward and he developed a very distinct metastasis above the testicular tumor.

Dr Robert E. Lund administered deep x ray therapy to the tumor mass and abdomen giving him three erythema doses the original just under the erythema dose with our deep x ray machine (sixty minutes) the second two weeks later sixty minutes to his abdomen sixty minutes to his testicle and three weeks later twenty minutes from behind treating the posterior abdomen. Following this he had three quarters of a dose of roentgen over the skull. After the operation he received another sixty minute over the inguinal region.

My impression is that the operation on the left side was probably for a simple undescended testicle which was taken out. It probably was not a testicular carcinoma but testicular is very rare. I think we can limit the histological operation on the left side as long as anything to do with the present condition.

His main symptom started long before the testicular tumor began to grow and the question is whether the primary tumor is in the testicle or in the brain. I believe we are dealing with two separate tumors. I have seen a few testicular tumors

metastasize to the brain. Generally they metastasize to the lung glands or bone but rarely to the brain. My inclination is that the tumor began in the testicle where it was unnoticed for a long time metastasized to the brain and later began growing in the testicle.

The interesting feature of the testicular condition is that apparently the tumor is of the radiosensitive type as the mass in the abdomen disappeared under deep x-ray radiation. Most testicular tumors vary from the embryonal or undifferentiated type—extremely radio sensitive to the adult type—comparatively radio resistant. Radiation of the embryonal tumors produces an extraordinary effect.

We have had 3 cases in which the diagnosis was made and finally confirmed in which we radiated the testicular tumor where Dr. Lwing could find only traces of the tumor in the removed testicle. Recently I saw a patient who three years ago had a teratoma of the testicle with metastasis in the abdomen and lungs. He had lost a great deal of weight and we considered his condition critical. We radiated him much and often. He still has his testicle his lung metastasis cleared up within two months and today he is working and has regained his weight and health. How long he will last I do not know but we have held him at least for three years.

I think these radio sensitive tumors are essentially very malignant and the more malignant they are—according to Broders' classification Class IV—the more radio sensitive they are. For this reason I would rather have a very malignant tumor to deal with than a less malignant one. We treat them first by giving them as much radiation as they can stand. This often destroys the primary tumor and controls the metastasis. The testicle is usually removed some months after radiation.

DR. LEON CORNWALL. In my opinion this patient has a diffusely infiltrating neoplasm in the left central hemisphere. It may have extended to the right side. As there is no possibility of surgical removal any therapy that gives any relief of the clinical symptoms should be encouraged. It is my impression that this man has improved since the radiation of the skull.

There is no question that a Dr Goldstein says this is a slow growing tumor. It may be highly malignant microscopically but certainly in its clinical manifestations it is evidently slow growing. This man has done very well. It is barely possible although there is no proof that the primary focus was in the testicle that was removed two years ago. If the clinical response to x-ray or radium therapy is favorable I think it should be continued.

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## CLINIC OF DR. B. S. BARRINGER

### FIFTH AVENUE HOSPITAL

#### A METHOD FOR THE CONTROL OF HEMORRHAGE AFTER SUPRAPUBIC PROSTATECTOMY

Most surgeons today use some device to control hemorrhage after prostatectomy. They use simple gauze packing the Hager bag or one of its modifications or they suture the torn prostatic sheath after the method described by Cabot and Lower.

The suture of the prostatic sheath would be the method of choice if its performance did not prolong the operation too much. The length of operation, however, is less a factor if the anesthesia is spinal or sacral in type instead of general.

In 1919 I reported a method of packing the prostatic cavity with gauze after enucleation placing a sponge forceps on the gland to exert pressure if the bleeding was not controlled. At the end of twenty-four hours the sponge stick was removed, the packing at the end of forty-eight hours. However, I have seen considerable hemorrhage and shock upon the removal of the packing, although during its use I have not lost a patient from hemorrhage.

Because of the difficulty in removing the gauze I have during the last two years used the Hager bag in various cases. It is placed in and controlled through the suprapubic opening. The rubber tube—connected with the bag instead of having its exit through the urethra—is threaded through a hollow metal tube, the bag placed in the prostatic cavity, the tube coming out of the suprapubic wound. The bag is then blown up and pressure exerted upon it by the metal tube.

The size of the bag may vary according to the cavity of the prostate and the bag itself may be filled with either air or

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The size of the bag may vary according to the cavity of the prostate and the bag itself may be filled with either air or



water. At the end of twenty four hours the bag is deflated and if the bleeding has stopped entirely may be removed at the end of forty eight hours. In my hand this method is considerably simpler and causes less discomfort to the patient than if the tube exited through the urethra. The tube when in place forms an acute angle with the abdomen.

The only two conditions under which it has not been used successfully were (1) a case in which a not very large median lobe was

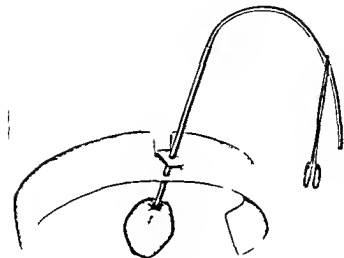


Fig 38

removed and in which no prostatic cysty was formed the patient bled quite consistently but not alarmingly until the bag was removed and a piece of gauze put down to the bleeding point (2) in a prostatectomy upon an obese patient whose large abdominal protuberance prevented the tube from being inserted in the right direction. While it did stop the blood it would have been better had the tube come out through the urethra if simple gauze packing of the prostate bed had been done.

The advantages of the tube are that it actually does control bleeding and the patient has less pain from it than from any other device I know. It can be removed with great ease. The

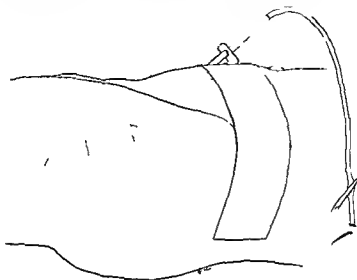


Fig 388

accompanying illustrations (Figs 387 and 388) show a method of fixing the tube on the abdomen. The large flat piece of brass can be made by any mechanic of material called spring brass.



## CLINIC OF DR. IFFON S. IOLLAUX

FROM THE DEPARTMENT OF OBSTETRIC FIFTH AVENUE HOSPITAL

### INDICATIONS FOR OPERATION IN 29 CÉSAREAN SECTIONS IN A SERIES OF 500 PRIVATE CASES WITH OBSERVATIONS ON TOXEMIA OF PREGNANCY AND POSTMATURITY

This article is based upon a review of the writer's most recent 500 private case deliveries in the Fifth Avenue Hospital covering a period of five years from May 1, 1928. The review of this series was suggested by the accumulation of literature in criticism of and defense of the increase in the incidence of cesarean section in obstetric practice.

The writer was mildly surprised at the frequency in which he has resorted to delivery by the lower abdominal route and has analyzed the indications and results in this series which seem to justify the widening sphere of this method of delivery.

In the brief synopsis of indications which follows several terms might be explained in order to clarify their interpretation especially to readers other than the obstetric surgeon.

The term "adequate test of labor." It has been well said that a test of labor should be judged by "How much a woman can accomplish not by how much she can endure."

It is difficult to set a given number of hours as an adequate test inasmuch as the character of tumultuous labor in one case might accomplish a much better preparation of labor in fact due to the patient's ability to bear a longer and gradual increase in frequency and character of contractions might in another.

The question of fatigue is judged by physical signs especially the pulse rate, blood pressure and general appearance of the patient rather than the expressed request of the patient or of

the relatives that something be done. We are somewhat prone to allow the stoical individual willing to give her last ounce of physical reserve to lessen her margin of safety by a tiny overlong and to interfere too soon in the highly nervous individual who gives up and begs for help before true labor is really instituted.

Cervical dilatation insufficient to justify vaginal delivery we believe to be secondary in importance only to an adequate pelvis and we venture to state that more obstetric tragedies are caused by injudicious efforts to perform version or forceps delivery through an insufficiently dilated cervix than by any other single factor.

This is especially true in the dry, tedious labor incident to posterior position and demand patience and the proper use of morphin in small doses early in labor and resort to more frequent low section in the case in which time and morphin fail.

The total number of cases sectioned were 29 or approximately one in 18 cases. There were no maternal deaths. One baby was delivered dead and 2 babies died soon after delivery.

Case XVII—Referred by a general practitioner had been in labor several days and the baby was dead on admission to the hospital. The fact that the baby seemed postmature, the measurements denoted ample flat pelvis with head overriding the symphysis and sufficient cervical dilatation section seemed indicated in spite of the fact that the baby was known to be dead.

Case XII—Caecoma of the rectum mentioned six and a half months ago to this baby was not considered viable and lived but a few minutes.

Case XVI—Pre-eclampsic developed eclampsia after operation. The baby was saved a half month gestation profoundly toxic and died but the mother lived. All other babies left the hospital in good condition.

#### INDICATIONS FOR OPERATION

Case I—Primipara aged twenty-eight seen in blood pressure 180/120 severe headache blurred vision operated

before onset of convulsion but developed convulsion post operative

Case II—Primipara aged twenty nine toxemia of nephritic type blood pressure 180/105 blurred vision erythema headache albumin hyaline and granular casts

Case III—Primipara aged twenty nine generally contracted flat pelvis posterior position adequate test of labor no engagement patient showing fatigue before dilatation sufficient to to justify any vaginal maneuver

Case IV—Primipara aged thirty two toxemia with blood pressure rising and convulsions seemingly imminent in spite of careful prenatal care blood pressure 192/110

Case V—Gravida II aged thirty two severe pyelitis with temperature ranging from 101 to 104 F previously sectioned two years ago for dystocia complicated by pyelitis

Case VI—Gravida II previously sectioned (classic high section) for premature separation of placenta present labor complicated by premature rupture of membranes and posterior position

Case VII—Primipara aged twenty five generally contracted flat pelvis adequate test of labor no engagement occiput of symphyseal

Case VIII—Primipara aged thirty one ample flat pelvis external conjugate 15 cm elective section immediately at onset of labor

Case IX—Primipara aged thirty funnel pelvis breech presentation elective section at onset of labor

Case X—Elderly Primipara aged thirty nine toxemia—nephritic type blood pressure 178/110 urinary findings—albumin hyaline and granular casts

Case XI—Primipara aged twenty nine posterior position dry labor no descent after adequate test of labor insufficient cervical dilatation

Case XII—Primipara twenty seven years carcinoma of the rectum carcinomatous mass making vaginal delivery impossible section thirteen and a half months

Case XIII—Para II aged thirty four flat pelvis previous

delivery by high forceps with loss of baby adequate test of labor no engagement of head posterior position

Case XIV—Para II aged thirty flat pelvis large cyst on gonter previous twin pregnancy delivered vaginally each baby weighing less than 5 pound present child weighed 9 pound 3 ounces no engagement of head after test of labor

Case XV—Para II previously sectioned with myomectomy present section elective before onset of labor

Case XVI—Primipara seven and a half months gestation severe headache blood pressure 190/120 convulsion seemed imminent

Case XVII—Primipara aged thirty-one flat pelvis and posterior position postmaturity baby weight 9 pound 3 ounces Test of labor

Case XVIII—Primipara aged thirty-one in labor several days baby dead some hours before admitted to hospital flat pelvis overriding head baby's weight 11 pound 1 ounce

Case XIX—Para III Same as Case XIV sectioned again fifteen months later

Case XX—Primipara aged twenty hyperthroid case posterior position dry labor sectioned on advice of medical consultant to terminate labor quickly

Case XXI—Primipara aged thirty-one breech presentation labor complicated by two large cystic tumors of left ovary both cysts pedunculated one pushed down in posterior cul-de-sac the other floating in abdomen Both cysts removed at time of section

Case XXII—Para II had lost first baby following forceps delivery patient obese and suffering from myocarditis flat pelvis posterior position test of labor

Case XXIII—Primipara aged thirty-six rachitic pelvis dwarf build type test of labor followed by no engagement of head

Case XXIV—Elderly primipara aged forty-six fifteen years married posterior position moderate test of labor sudden fatigue with non-engagement of head

Case XXV—Para VI aged forty-five twins separated at birth one hand and arm present through maternal rupture

tured had lost baby one year previous by version anxious to have living child to second husband

Case XXVI—Primipara aged thirty four moderately contracted pelvis posterior position violent test of labor baby weighed 11 pound 15 ounces

Case XXVII—Same as Case IX Elective section at onset of labor

Case XXVIII—Primipara thirty six eleven years married posterior position dry labor thirty six hour test no engagement

Case XXIX—Primipara aged twenty six generally contracted juvenile pelvis twenty four hour test of labor patient showing fatigue without accomplishing dilatation or engagement of head

In this series 19 cases were sectioned by trachelolaparotomy and 10 by the classical high section through the upper uterine segment

Five of the series were sectioned for the second time 2 cases IX and XXVII and XIV and XIX were sectioned twice during this series each by the low cervical method and Cases V and VI were repeated classic sections and Case XV was a low section following a high section previously performed

There were 5 cases in whom the chief indication was toxemia Cases I II IV X and XVI These cases were all under careful prenatal supervision They were all hospitalized when the toxemia became progressively more manifest in spite of rest elimination non protein salt free diet etc

When the pressure usual disturbances urinary findings headaches edema etc failed to respond to treatment and convulsions seemed imminent or inevitable section was performed promptly under gas and oxygen or ethylene anesthesia None of these cases had convulsions before operation although Cases I and XVI had postpartum eclampsia

There has been much discussion as to the relative merits of the conservative and radical method in the treatment of eclampsia and there seems to be little doubt that conservatism in the treatment of toxemia of pregnancy with convulsion has definitely reduced the mortality



delivery by high forceps with loss of baby adequate estimate  
labor no engagement of head posterior position

Case XIV—Para II aged thirty five pelvis  
got on previous twin pregnancy delivered vaginal  
weighing less than a pound present child was  
a ounce no engagement of head after ten hours

Case XV—Para II previous sectioned  
present section elective before onset of labor

Case XVI—Primipara seven and a half  
severe headache blood pressure 190  
inmmment.

Case XVII—Primipara  
posterior position postpartum  
Ten hours of labor

Case XVIII—  
dead baby dead some  
pelvis overriding head

Case XIX—Para  
nineteen months late

Case XX—Primipara  
transverse position delivery  
sufficient to terminate

Case XXI—Para  
labor complicated by  
both cysts pedunculated  
as the other floating  
time of section

Case XXII—Para I  
delivery patient obese  
pelvis posterior position

Case XXIII—Primipara  
type test of labor

Case XXIV—Forty  
year married, postpartum  
fetus with non

Case XXV—Para VI  
tumor hand and arm present



tured had lost baby one year previous by version anxious to have living child to second husband

Case XXVI—Primipara aged thirty four moderately contracted pelvis posterior position violent test of labor baby weighed 11 pounds 15 ounces

Case XXVII—Same as Case IX Elective section at onset of labor

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Five of the series were sectioned for the second time 2 cases IX and XXVII and XIV and XA were sectioned twice during this series each by the low cervical method and Cases V and VI were repeated classic sections and Case XV was a low section following a high section previously performed

There were 5 cases in whom the chief indication was toxemia Cases I II IV X and XVI These cases were all under careful prenatal supervision They were all hospitalized when the toxemia became progressively more manifest in spite of rest elimination non protein salt free diet etc

When the pressure usual disturbances urinary findings headaches edema etc failed to respond to treatment and convulsions seemed imminent or inevitable section was performed promptly under gas and oxygen or ethylene anesthesia None of these cases had convulsions before operation although Cases I and XVI had postpartum eclampsia

There has been much discussion as to the relative merits of the conservative and radical methods in the treatment of eclampsia and there seems to be little doubt that conservatism in the treatment of toxemia of pregnancy with convulsion has definitely reduced the mortality

The pre eclamptic case however especially the primipara with little or no cervical dilatation and with a viable baby which can be sectioned before the onset of convulsions under gas ethylene or local anesthetic has a definite advantage over the case which enters the convulsive stage undelivered.

The temporary drop in blood pressure due to loss of blood incident to operation the use of the Levin's tube through the nose to be left in place for several days if needed and through which lavage and instillation of fluid and saline laxatives may be accomplished with patient unconscious or semiconscious. The free use of morphin the intra venous injection of glucose solutions have in our hand given the best results in the cases in which convulsions seem inevitable.

When convulsion have intervened however the indication for cesarean section is certainly not so well founded and it is the writer's opinion that in the majority of these cases morphin Levin's tube glucose intravenously and ectal use of luminal and chloral and to defer the emptying of the uterus until convulsions are controlled will give better results.

Although the writer in the past six years has not sectioned a case after convulsions have intervened we are not convinced that section via the lower abdominal route under ethylene anesthesia is not indicated in an occasional case even though convulsions have intervened.

A convulsive case in the hand of an obstetric surgeon is proper hospital surrounding. It killed an artist and a student might well be a caution in spite of the onset of convulsions but decision must be made by the obstetrician capable of judging the merit of the individual case and where grave doubt exists conservative method should be favored.

In this series there were 4 cases XIV XVII XVIII XXVI which we believe were definitely postmature. In Case XIV and XVII the babies weighed 9 pound and 3 ounce. Case XVIII 11 pounds and 1 ounce and Case XXVI 11 pound and 15 ounces.

There has been considerable discussion as to the advisability of the induction of labor for postmaturity. It includes physical

of the subject that could lead us far afield such as diagnosis of postmaturity by means of fetalometry the dangers of infection and dystocia as well as prematurity

The writer has no quarrel with the advocates of medical measures to institute labor in the obviously postmature case for even though the castor oil and quinin and pituitrin extract methods do fail entirely or fail to produce the quality of labor that will terminate in spontaneous delivery these methods do not as a rule increase the danger of surgical intervention when indicated

The stripping of the membranes with the gloved finger in multipara with some degree of dilatation is not necessarily harmful when there seems to be some indication in addition to postmaturity such as toxemia or in the cardiopath

When it comes to the introduction of rectal tube or hydrostatic bag or manual dilatation of the cervix for postmaturity alone in addition to the use of pituitary extract we believe the practice should be severely condemned

The safety of both mother and baby will be conserved if spontaneous labor is awaited even though the size of the fetal head may necessitate low section

It must be remembered that in a very large percentage of postmature cases especially in the primipara in which the head fails to engage prior to labor we are dealing with a posterior position

Also it is a fact that bag frequently fails and each repetition increases the chance of infection dystocia results in a high percentage of cases due to inadequate labor pains and rigid placental tissues and the incidence of difficult forcep deliveries or versions is so high in induced cases

The writer believes that the above listed case of postmaturity excusing Case XVIII in which section should have been performed much sooner justified the test of labor followed by section in each case for serious dystocia might have developed following the induction of labor even weeks before the onset of labor

With increasing efficiency in obstetric anesthesia with more

general acceptance of the lower segment approach which certainly entails less shock less incidence of peritonitis and less gastric dilatation why not note more carefully the progress of labor and choose more frequently the lower abdominal route in borderline cases?

The old statement that The mortality of cesarean section is in direct proportion to the number of hour the patient has been in labor does not hold good when watchful waiting combined with the ability and judgment to interfere surgically not as a last resort but as a safe and sane compromise between nature effort at a spontaneous outcome and the obstetrician's injudicious efforts to effect delivery vaginally.

## CLINIC OF DR. ARCHIBALD L. DEAN, JR.

FIFTH AVENUE HOSPITAL

### TWO UNUSUAL CASES OF KIDNEY DISEASE

THE following urological case are of interest because active disease in other organs masked the few kidney symptoms for a considerable time.

**Case I**—W. McC. (F. A. H. 485) a white clerk, single, age nineteen years. Admitted to Outpatient Department December 13, 1922.

*Family History*—One brother chronically ill with non-rheumatic heart disease; parent and two brothers and three sisters all living and well.

The patient can remember no serious childhood illness. He never had a sore throat. He never visited a dentist although there were always aches and pains in the teeth.

When sixteen (1914) while at play a wagon ran over the instep and toes of the left foot. There was merely a bruise and the boy played in a game of football that same afternoon. In two weeks all the swellings had left the foot.

Five months later pain appeared in the left foot especially about the ankle and transverse arch. Within a few days the right ankle became similarly affected. The patient was treated for two years with foot braces, exercise, etc. In spite of this treatment each knee and hip became involved in the arthritic process. Walking became extremely difficult.

At this time he entered a hospital where he remained in bed for four months. Here he suffered with several attacks of acute arthritis which involved all of his joints in turn except those of the cervical spine. Faded decayed teeth were removed.

About this time pain were noted in each loin. These were severe enough to prevent sleep for several days. There was no radiation anteriorly nor were urinary symptoms present.

In December 1977 when nineteen the boy first visited the Fifth Avenue Hospital. Physical examination revealed a somewhat emaciated youth obviously seriously crippled. The positive findings were: Teeth poor tonsils deeply set ragged cryptic. Pus expressed from the right tonsil. Heart slightly enlarged with the suggestion of a double mitral murmur. Chronic arthritis of ankles knees hips and spine.

A brace was furnished to support the spine the tonsils were removed and many teeth were extracted. The *Streptococcus haemolyticus* was recovered from the tonsil.

For five years the most effective form of interferon protein therapy but even urecine and physical agents were employed with indifferent success.

In July 1977 the patient suffered an attack of polyuria (nightly or six times daily every three hours) associated with severe pains in each costovertebral region. No treatment was given and the condition cleared up in two to three weeks. In January 1978 some blood was seen in a small blood specimen of urine. He did not meet with this at the time.

On February 21, 1978 the patient came about the Fifth Avenue Hospital but ill. He stated that two days previously he began to suffer with pain in the right upper abdomen nausea and vomiting. The bowel moved with a cathartic. The pain became localized more completely in the abdomen and somewhat more toward the right lower quadrant. There were no urinary symptoms. The following day the pain subsided but on the day of admission it became more severe. The pain localized to his distal midline in the right flank initially.

Examination by Dr. Kim L. Roberts revealed tenderness of the right upper quadrant high in the right lower quadrant tenderness on pressure over the right kidney with tenderness along the course of the right ureter. Murphy's sign absent rectal temperature 100°F pulse 80 urea nitrogen 28.3 mg blood glucose 0.111 white blood cell

13,700 polymorphonuclear leukocytes 82 per cent lymphocytes 14 per cent mononuclear leukocyte 3 per cent non-lobulated polymorphonuclear leukocytes 40 per cent the urine was cloudy filled with red blood cell white blood cell and cellular casts A urologic consultation was requested

The patient was seen propped comfortably in bed apparently in no pain A cystoscope was passed without difficulty The bladder mucosa appeared normal Two small blood clots were seen on the right side of the bladder base They were un-



Fig 389—C I I M ght M lt pl l l l t l l  
(l ft k d s)

attached The uterine orifices seemed normal although no excretion was noted from the right side A No 6 French catheter was passed easily to the left kidney On the right side an impassable obstruction was met 15 cm from the ureteral meatus Clear urine was collected from the left kidney 4 or 5 drops of bloody urine came from the right catheter Films made of the kidney tract with opaque catheter in the ureters show the following (Fig 389) The left catheter is up in the pelvis of the kidney The right catheter the promontory of the sacrum There is a circled area in line with the right ureter 2 inches



above the tip of the catheter. The size, shape, and position of this area is that of a ureteral calculus. An attempt was made to inject sodium iodide into the right ureter, but none would pass the promontory of the sacrum. The calcified area is  $\frac{3}{4}$  inch long and  $\frac{1}{2}$  inch wide. There is a group of calcified areas in the region of the pelvis of the left kidney. These are apparently renal calculi, but there is such a large amount of gas in the intestinal tract that the detail is obscured.



Fig. 390.—The calcified area in the region of the base of the bladder.

The calcified area in the region of the base of the bladder is a trifle to the right. The calcified area in the bladder or in the prostate.

It was decided to make the attempt from the right ureter the following morning. A film taken immediately before operation revealed the calcified area in the right ureter about  $\frac{3}{4}$  inch (Fig. 390). For the operation, a spot was placed and dilatation of the ureter through the cystoscope was begun. Fluid was forced in little by little and examined carefully.

The lower right ureter was dilated to No 11 French on February 29th and on March 5th. No anesthetic was necessary. At the later manipulation it was found possible to pass a No 5 French catheter to the kidney pelvis. There was a pelvic retention of 30 c.c. clear urine and normal kidney function was proved. Although no unusual resistance was felt the calculus was pushed 10 cm. upward by this maneuver.

Catheters No 8 French were passed easily to the pelvis of the left kidney and the excretion was normal.

On March 8th associated with moderate discomfort on the left side of the abdomen two small calculi were voided in the urine.

On March 12th there was a severe colicky pain in the right abdomen. The next day it was still worse the urine became bloody and a rather large calculus was voided. This cleared the right ureter.

On March 14th a No 11 French bougie was passed to the left kidney pelvis. A retention of 52 c.c. clear urine was noted. A pyelogram confirmed the impression of dilatation of the pelvis.

The patient was in no discomfort and he was encouraged to be up and about. By March 26th he had passed 9 calculi of various size. The film taken at this time (Fig. 391) revealed only one shadow in the region of the pelvis of the left kidney. This is about the size of the stone that was passed from the right ureter.

The patient was discharged to his home directed to watch for the passing of a stone and return for observation and ureteral dilatation every two weeks.

April 16, 1928. Urinalysis normal. No red blood cells, albumin, casts or pus.

May 1, 1928. Patient has a better color and declares that he has not felt so well in years. States that he can stand straight and that on the whole his joint move more freely. There are no urinary symptoms. Each ureter dilated easily with No 11 French bougie.

Comment.—It seems likely that both the arthritis and the renal calculi can be ascribed to the focus of infection which existed

above the tip of the catheter. The size, shape and position of this area is that of a ureteral calculus. An attempt was made to inject sodium iodide into the right ureter, but none would pass the promontory of the sacrum. The calcified area is  $\frac{1}{2}$  inch long and  $\frac{1}{4}$  inch wide. There is a group of calcified areas in the region of the pelvis of the left kidney. These are apparently renal calculi, but there is such a large amount of gas in the intestinal tract that the detail is obscured.



Fig. 390. The calcified area in the right ureter and bladder.

There is calcification of the region of the base of the bladder and the right ureter. This is either a stone in the bladder or in the prostate.

It was decided to remove the stone from the right ureter the following morning. A film taken immediately before the operation revealed the calculus. The catheter was moved downward about 2 inches (Fig. 390). Following irrigation, a prostatic and dilatation of the urethra with the cystoscope was begun. Fluid was forced down the ureter and collected and examined carefully.

Perhaps the most reasonable explanation is that the infected teeth and tonsils caused the arthritis and the bilateral pyelitis which preceded stone formation. Later in spite of the removal of the primary foci in the mouth the arthritis was continued by the secondary foci existing in the renal pelve. Also this would account for the failure of the patient to improve under vaccine and foreign protein therapy.

At any rate a consideration of this baffling illness suggests that in any protracted case of arthritis it might be well to determine whether or not pyelitis is present. If detected proper treatment gives relief promptly and metastatic dissemination may be avoided.

Finally this case illustrates the rapidity with which as many as 9 renal calculi may be passed through natural channels with the aid of a few cystoscopic dilatations of the ureter.

**Case II—C. W. (F. A. H. 2161)** single chambermaid age thirty five years admitted August 16 1923.

**Chief complaint.** Pain in back burning in epigastrium belching of gas and vomiting of six years duration.

**Family and past history** of no especial significance.

Patient states that within ten minutes of eating she is compelled to vomit. Associated with the vomiting there is nausea profuse belching and a burning pain in the epigastrium.

For the past eleven months there has been a pain nearly constant which seems to originate in the lower thoracic vertebrae and radiates up the spinal column. In the epigastrium there have been intermittent pains which radiate to the left. Sometimes these pains are sharp and stabbing and occasionally they last for several minutes. The woman has lost 25 pounds in the last five years.

Physical examination revealed a thin woman lying in bed apparently comfortable. The only abnormal findings were several crowned teeth and a slight tenderness over McBurney's point on deep palpation. Blood pressure Systolic 100 diastolic 55.

Upon x-ray examination The gall bladder shows no definite

in the tonsil and about the roots of the many decayed teeth. At least insofar as the kidneys are concerned the bilateral incidence which various observers have found in from 17 to 18 per cent of cases of renal calculus suggests some causative agent probably outside the urinary tract affecting both kidney pelvises in common.

The experimental work of Roe and Bumpus in recovering the *Streptococcus hemolyticus* from infected tooth root in patients suffering from renal calculus and the retention of the forma-

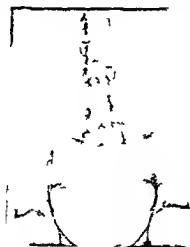


Fig. 391—C. d. h. p. t. t. f. a. c. h. g. e. d. A. g. l. l. e. u. l. b. l. h. l. f. t. k. i. d. n. e. y. p. e. l.

tion of renal calculus in relation to which the same bacteria had been injected from the tooth. The results of the potential of the bacteria in such focus also show the remarkable selectivity exhibited by the organism.

On the other hand renal calculus has a remarkably rapid destruction of the kidney while we found each pelvis dilated markedly with function very or completely lost. The reason and because all patients thought that they had been removed six years ago, it might be possible that the renal pelvises were infected secondarily from the many infected teeth.

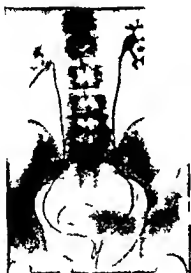


Fig 393—\ m l l f t k d y pelvi



Fig 394—Th f th tl tl b m l pp l f t k d y  
r l d t d

evidence of pathology. The stomach is rather large and low in position. No filling defects were observed. The duodenal cap revealed a persistent filling defect of the right side of the apex which is suggestive of an old ulcer without any interference with function. The colon is very low, somewhat dilated and retains most of the barium at twenty-four hours. A segmented appendix was visualized only after a barium enema.

A posterior gastroenterostomy and appendicectomy was performed. The gall bladder was found to be normal. There was



Fig. 30.—Normal stomach and pelvis.

a narrow pyloric ring and some evidence of an old gastric ulcer with no palpation of the abdominal area.

This operation did not relieve the patient's symptoms. In addition, a careful diet regime followed for several months gave no relief.

A roentgenographic study made at this time revealed definite evidence of duodenal obstruction at the pyloric end of the stomach causing it to be pulled upward and slightly to the right. The treatment of this patient was

Lower left kidney pelvis normal with normal calices urine normal urea concentration 0.8 per cent dye elimination 11 per cent culture no growth

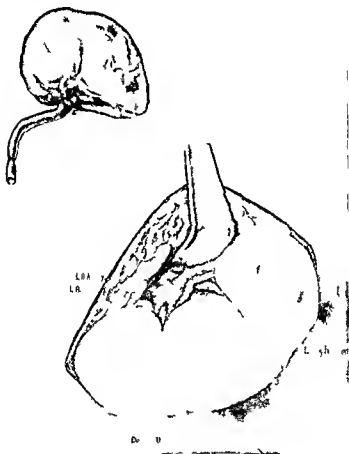


Fig 39 —Th pe 6 d g h h pl f l g n t t d Th  
pp d w g f th p f l d y d t m d

Upper left kidney pelvis enlarged and irregular with no distinct calices urine contained a moderate number of leukocytes urea



the stomach is empty in six hours. There is no pyloric tenderness, no gastric retention, no ileal stasis.

Accordingly an operation was performed to relieve the adhesions formed following the gastroenterostomy. This definitely gave relief.

Two months later the woman returned to the hospital complaining of a constant pain in the left costovertebral angle shooting in character. There were no urinary symptoms.

During the following month while the gastric symptom continued to abate the pain in the left lumbar region increased in severity. Occasionally there was polyuria. Urinalysis showed no abnormality.

A cystoscopic examination revealed two ureteral orifices on the left side of an otherwise normal bladder. Radiography studies made with catheters inserted in each of the ureters demonstrated that the caecal ureter and each is connected with a pelvis in the region of the left kidney. The lower pelvis is apparently normal and has a complete set of normal calices. The upper is irregular and is regular and there are no distinct calices. The upper shadow is very suggestive of a destructive process. There is no evidence of any calculus.

The patient was treated with pelvic irradiation for a while and then failed to return to the clinic.

She was next seen April 1, 1938 complaining bitterly of pain in the left costovertebral angle. It was so severe that she had been unable to walk regularly.

Upon cystoscopic examination the bladder mucous membrane was found to be normal. The ureteral orifices were situated into three ureteral orifices. On the right side of the bladder the left ureter opened from a high position. Specimens were obtained for laboratory examination. An intravenous pyelographic examination was performed and urine collected for culture and roentgen examination. It was found that the infection was localized to the left kidney.

The following conditions were found:  
 Right kidney: Normal pelvis and calices, normal urea concentration, 0 percent deviation, 10 percent culture, no growth.

## CLINIC OF DR. JOHN E. TRITSCH

### SECTION OF OBSTETRICS FIFTH WYNUF HOSPITAL

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#### PRELIMINARY REPORT OF A METHOD OF SUMMARIZING OBSTETRICAL CHARTS

RECOGNIZING the need in the usual general hospital of a recording system for complete statistical purposes a plan is here presented which is now in operation in the section of obstetrics to properly summarize the charts of patients delivered in the hospital.

The objections to the previous method of recording are as follows:

1 The book of nomenclature used only include diagnoses and was inadequate even for that purpose. A number of important diagnoses were omitted including pre-eclamptic and nephritic toxemia hyperemes gravidarum puerperal fever contracted pelvis and prolapsed cord. There is included no classification of operative procedure.

2 The work was done by a layman and as a consequence important omissions were made due to lack of understanding of the subject.

3 Card indexing mentioned only the discharge number of the case without any detail thereby entailing tedious search for the chart to obtain further information in many of the instances.

4 No periodical statistics were made available.

The present system carried on by a member of the attending staff thus eliminating the objection relative to understanding of the subject. The nomenclature has been enlarged and includes terms of more common usage. It involves three principal forms of data:

concentration 0.8 per cent dye elimination 2 per cent culture no growth

It was thought that the diseased upper kidney pelvis was the cause of the patient's disability and she was admitted for operation.

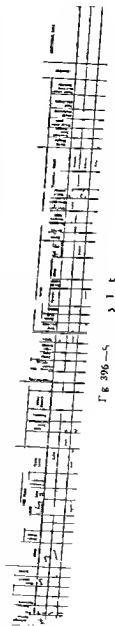
On May 4, 1928 Dr. F. W. Bancroft performed a partial nephrectomy. He described the operation as follows: Ethylene anesthesia. Patient on right side in extreme lateral flexion. Left oblique kidney incision latissimus dorsi divided. The lumbar triangle was exposed. The peritoneum of the twelfth rib was divided and stripped and the rib removed. The kidney was palpated freed by blunt dissection with the finger and delivered. Two ureters were identified. The blood supply to the lower and upper poles was identified and a cleft between the two pelvis was seen. The vessels of the upper pole were ligated *en masse*. The fatty capsule was stripped back, the upper ureter was divided 8 cm. from the pelvis and with the hand on the lower portion of the kidney a *catarquet* was cut through. Bleeding was moderate and was controlled by deep mattress sutures of chromic. Edges were approximated and the fatty capsule sutured over the stump. All bleeders ligated. Muscle closed with Lukens catgut. Tension suture skin clamp one closed and one rubber tube drain.

May 14, 1928. Patient recovered readily from operation. Upon careful questioning she stated that although there is moderate sore about the wound the pain of which she complained previously has entirely disappeared.

These cases are presented simply to illustrate histologic diagnosis. Each of the patients is still under treatment and no data can be given as to regarding the final result of the urologic treatment.



1 Summary chart (Fig. 96) which comprises a large sheet giving a brief of each case delivered. After the patient's discharge from the hospital the data are obtained from her chart. All abnormalities and operative procedures are recorded upon this sheet and thereby reference is made to card in box (Fig. 397).







greater detail the data on abnormalities or operative procedures in each case (Fig. 398)

3 Periodic Summary (see below) —Each month a summary is made of the cases delivered during that month in which is noted the number of cases deaths types of abnormalities operation etc. as well as percentages with results obtained. The information for these summaries is easily gathered by reference to the summary chart and card index. Quarterly semiannual or annual reports may also be made.

Among the advantages accruing from this system of record in may be mentioned

1 The section head is made thoroughly acquainted with all cases delivered on the obstetrical floor of the hospital

2 Statistical reports are made at definite times for comparison of different periods with a view to improvement of results wherever possible. As for example assuming the corrected morbidity rate excessively high inquiry could be easily made to determine the number of vaginal examinations or operative procedure practised the virtues of the indications therefore etc. in the infected cases. The same might be said of the preference in method of treatment or operative procedures.

3 The statistics are relatively reliable having been arrived at by one conversant with the subject.

4 Obstetrician delivering cases at the hospital keep up their charts better as a result of this constant check up for recording.

5 For the writing of scientific papers data on types of cases are easily obtainable.

One of the difficulties consists in the absence of a universal standardization especially in the matter of stillbirth infantile deaths and puerperal fever.

In our statistics we have been changing as stillborn all fetuses born dead regardless of the month of gestation or other data related to this case. Death of infants after delivery offers another difficulty in standardization some of the infants die as a result of the delivery other do not some die a few minutes or a few hours after delivery some weeks or even months



later as a result of birth trauma. In our periodic summary we have included all death occurring during the mother's stay in the hospital noting the period of gestation and cause of death.

Puerperal fever, perhaps the subject presenting the greatest need for standardization. We have followed the method suggested by the B. M. A. and in our summary we eliminate one day fevers and infection proven not to originate from the delivery itself.

A universal standardization of nomenclature and method of arrival at statistics would be generally welcome for it is only in this way that comparative figures of different institutions could possibly be of any value.

We fully appreciate the fact that many imperfection will probably be found in this method of approach of this very important subject but hope that by time and experience we shall come closer to the desired goal of perfection.

**Conclusions**—1 In the average general hospital the recording of obstetrical diagnoses and treatment is inadequate.

2 The above system is offered as a step toward obtaining better records and more reliable statistics.

3 The comparison of periodic statistics should lead to conclusions as to causes of poor results with subsequent improvement.

4 The general standardization of certain phases of obstetrical work such as nomenclature stillbirths, death and puerperal fever is necessary for proper statistical comparison.

#### SUMMARY OF OBSTETRICAL CASES FOR FIRST QUARTER OF 1918

		JANUARY		FEBRUARY		MARCH	
I. N. C.	A. M. b.	155		P. m. p. x		10	
				M. l. p. x		83	
	B. I. f.	120		C. l. f. t.			
II. D.	A. P.			d. p.			
	I. N. mal.	154		81		p. c.	
	L. O. A.	89					
	R. O. A.	55					
	U. k. w.	10					

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		F	t	l	l y	1	0.526	p	t
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		M	t	l	m t l ty	0			
		F	t	l	m t l ty	1	0.526	p	t

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## CLINIC OF DR EDMONDE D NEFF

NEW YORK CITY

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### THE DIAGNOSIS OF OPERATIVE ACUTE MASTOIDITIS

THIS subject is of such tremendous importance in the prevention of intracranial complications (otic in origin) that I wish to relate a recent case which illustrates clearly that early diagnosis and thus prevention is the one great essential. I wish you would follow this case closely and note what transpired.

This is the history of a child male aged twenty months. He had always been healthy, could walk and talk and was quite normal. On December 10th last he developed a nose cold followed in ten days by convulsions. The latter were attended with temperature of 106 to 108 F and lasted about two weeks; a diagnosis of tetanus was made and the serum was administered. Following the cessation of convulsion and high temperature the child remained very restless, showing great agitation of the upper and lower extremities and constant movements of the head; he was changed mentally and did not appear to see or hear. Because of this greatly changed mental state he was removed February 20th to the New York Neurologic Institute where a provisional diagnosis of encephalitis was made; the spinal fluid was negative and the only focus of infection found was a discharging left ear which had previously been overlooked.

When first examined by me February 21 1928 the drum was found thickened and bulging indicating a process of several weeks duration; the organism found was *Streptococcus haemolyticus*. On February 24th the left mastoid was operated; the cavity throughout showed a residual hemorrhagic process; the cells everywhere were soft and brittle, more so in the middle



**Postoperative Condition**—Almost immediately following the operation the child showed relief from the constant agitation of the extremities and began to sleep better. He also began to take nourishment better, gaining in weight. His general condition was greatly improved. The vision and hearing were not improved although the neurologic prognosis is hopeful.

Now what transpired in this very instructive case.



Fig. 400.—D. p. d. h. g. b. m. p. d. d. l. t. f. t. d.

The etiologic factor was mastoiditis of *Streptococcus hæmolyticus* type complicated by a localized meningitis and an encephalitis. The meningitis became circumscribed and saved the child's life; the encephalitis was attended with damage of the olfactory, optic and auditory nerve. This was not a bacteriologic encephalitis; death would have ensued. It is Tilney's opinion from his wide study of encephalitis that it is a destructive process of brain tissue due to toxins and probably not organism.

This was a particularly nice case from the beginning and was



fossa region. The dural plate over the middle fossa membrane was very adherent and when the membrane was uncovered it appeared under great pressure and was very much thickened (Fig. 399). The lateral sinus was uncovered and found of normal hue and resistance. The dura in the middle fossa was then further exposed (1 x 1 inches) and an aspirating needle was carried through the bulging thickened membrane. One ounce of straw-colored fluid was removed and the dura incised 1 inch in length.

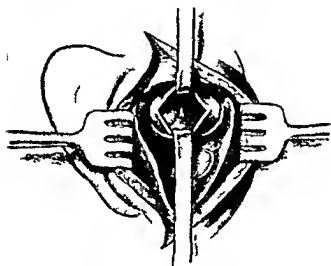


Fig. 399—The middle fossa dura is being reflected. The lateral sinus is visible through the opening in the dura.

and returned to the normal state greatly compressed anemic and very firm in appearance (Fig. 400). A gauze wick was carried into the middle fossa and the mastoid cavity was packed with gauze and the wound partially closed. The wound drained profusely for two days, after which the gauze wick in the dura was removed and the wound closed. On March 25th the mastoid had healed and the head was dressed so far as the external wound was concerned.

Postoperative Condition — Almost immediately following the operation the child showed relief from the constant agitation of the extremities and began to sleep better. He also began to take nourishment better, gaining in weight, his general condition was greatly improved. The vision and hearing were not improved although the neurologic prognosis is hopeful.

Now what transpired in this very instructive case



Fig 400 — D p d h w g b mp d d l t f t  
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The etiologic factor was mastoiditis of Streptococcus hemolyticus type complicated by a localized meningitis and an encephalitis. The meningitis became irremediable and saved the child's life. The encephalitis was attended with damage of the olfactory, optic and auditory nerves. This was not a bacteriologic encephalitis. Death would have ensued. It is Tilney's opinion from his wide study of encephalitis that it is a destructive process of brain tissue due to toxins and probably not organism.

This was essentially an error from the beginning and was

overlooked permitting the chain of destructive complication to follow. I have cited this interesting case to illustrate the great importance of early diagnosis in acute mastoiditis. The majority of intracranial cases are fatal this case undoubtedly permanently damaged with probable loss of vision and hearing. It is possible that early diagnosis in this case might have prevented the almost fatal complication.

The determination of operative mastoiditis is a matter constantly before the otologist for his decision it only occasionally comes before the general surgeon and general practitioner for consideration. I realize the tendency on the part of the general surgeon and general practitioner when meeting the otologist in suspected operative mastoiditis to evade taking a positive stand or to hesitate to give an opinion. I readily understand this hesitation because of the rare and isolated cases coming under their observation which place them at some disadvantage in attempting a diagnosis. In this brief review I will try to simplify this matter of recognition in operative mastoiditis.

It is sometimes difficult to decide when acute mastoiditis has passed the stage of further observation and has become operative. It is true that the mere evidence of resolution but they do not utilize the resolution after the well developed certain physical signs which classify them as operative cases.

One point I wish to emphasize before proceeding is the frequency of mistaking mastoiditis between the first and second stages of the middle ear and mastoiditis. In the former namely middle ear abscesses and acute mastoiditis, pain is often referred to the mastoid giving the false impression of the mastoid cell. However, the diagnosis of mastoiditis is usually made. Because of the middle ear is prone to clear up spontaneously in a large percentage of cases the physician must be that acute mastoiditis is a large percentage of cases unless resolution and clearing up. The only thing that cleared up is middle ear abscess but the middle ear mastoiditis. Many middle ear cases subside promptly by better free drainage through the drum by prompt neurectomy by

inclusion some cases obtain free drainage through the eustachian tube. Therefore this confusion in diagnosis and the explanation of the frequent delay in advanced cases due to inability to differentiate between trouble confined to the middle ear and definite advanced mastoiditis.

Acute fulminating mastoiditis should be regarded in the same class with acute fulminating appendicitis; the latter unoperated promptly develops peritonitis and goes on to a fatal termination; acute mastoiditis unoperated may develop meningitis and pass on to a quick fatal conclusion. Especially is this true in children owing to the uncompleted suture (squamoso-petrosal) in the roof of the temporal bone. The fatal course in children may be as brief as four to six days. Just recently a brother physician's wife ran this rapid course following middle ear abscess in which the organism was demonstrated to be a virulent streptococcus (the mucosus capulatus). Young children one to five years of age are much more prone to the dangerous meningeal complication than adults, yet it occasionally occurs in the fully developed temporal bone.

The safety of early operation in acute appendicitis and the excellent results obtained apply equally well to the field of mastoid surgery. The burden of operative interference in early appendicitis and mastoiditis is slight and is easily borne; further more in the latter the importance of protecting and preserving the hearing mechanism by early operation should not be lost sight of. Early opening of the pus-laden mastoid means in the hand of the trained operator the removal of all cells containing pus and the immediate removal in large part of the risk of meningitis and brain abscess. Early drainage of the mastoid cavity prevents erosion of the sinus and dural plates which make possible the fatal complications. Much unilateral deafness is the result of delayed mastoid surgery resulting in fixation of the conducting chamber. This damage having taken place cannot later be corrected by any known treatment.

Now that at the differential points which guide the otologist in making the diagnosis of operative acute mastoiditis. These

various points may be conveniently grouped under three headings and in view of their importance take the order

- 1 Physical signs
- 2 History
- 3 Laboratory findings

1 **Physical Signs**—These are by far the most important in arriving at a diagnosis. Physical signs are always evaluated by comparing the diseased with the normal side. The first observation of importance is the amount of pus that may be profuse and under pulsation. This usually means pus production in the mastoid cavity with drainage from the antrum. This profuse discharge accompanied by bulging drum diffuse mastoid otitis tenderness with septic tongue and characteristic pathognomonic of operative mastoiditis. Temperature may be subnormal or show very slight elevation. If in addition the canal is narrowed by posterior scarification a positive diagnosis of mastoiditis can be made independent of history or laboratory findings. So I repeat with

- 1 Profuse continuous discharge
- 2 Bulging drum
- 3 Signs of canal
- 4 Mastoid tenderness

a diagnosis of operative mastoiditis is made with the the history be of short duration or much longer.

In rare cases the middle ear may appear uninvolved and advanced mastoiditis be present. In these cases sometimes called primary mastoiditis the infection passes from the throat through the eustachian tube into the middle ear and promptly invades the mastoid. The middle ear subsides with the healing of the drum while the mastoid infection continues. In some of these cases there may be a lapse of several weeks between onset of middle ear discharge and the appearance of mastoid pain and tenderness. General headache over the side involved may be the first symptom of suppurative mastoiditis. The drum may become normal while the mastoid cavity a destructive process has been well advanced without subjective or objective symptoms.

The important sign sagging of the posterosuperior canal wall with thickening of the drum almost always implies mastoid involvement in advanced form. Diffuse mastoid tenderness if extending to the tip region always means an operative condition. Edema accompanying mastoiditis always means periotical irritation and thickening due to pus in the underlying cell. This is not a common symptom and is always a late one. Pain as an objective physical sign if extending over the side of the head should suggest perisinus abscess or dural irritation. These are always outstanding signs and of great significance when present. As previously mentioned operative mastoiditis is occasionally present in the absence of middle ear signs namely discharge or bulging of the drum. Extensive mastoid involvement may show no tenderness owing to a very thick cortex; this type has been designated disguised mastoiditis; there is usually subjective pain late in the process. In such cases the x-ray picture is very helpful; it is also helpful in the mucous capsulatus cases having prolonged discharge but no pain. It must be remembered that the recognition of these irregular physical signs is the key to solving the difficult cases of mastoiditis.

2 History.—It is an axiom in otology that most otitis media and mastoiditis are secondary to acute infectious diseases of the upper respiratory tract and less common to infections of the blood stream. The classical childhood infections such as measles, mumps, scarlet fever, diphtheria, chickenpox, influenza and nose cold are the frequent causes of middle ear infections. Therefore the history of recent acute infectious disease has important bearing in otitis media and mastoiditis. The bathing season always yields a crop of otitis media cases, some of which develop operative mastoiditis. Recent tonsillitis, acute sinusitis and pneumonia may be promptly followed by middle ear infection making its way through the eustachian tube. A definite history can usually be obtained and should always be sought and utilized.

3 Laboratory Findings.—Laboratory findings are of great value in many cases but should always be regarded as confirmatory evidence only. The leukocyte count and the differen-

tial are helpful and much used but can be misleading at times as for instance the very high white count of cervical adenitis in children. Of the various laboratory procedures the x-ray is the most reliable and the most valuable. It aids in determining the extent and character of the disease and also gives definite information regarding the anatomy of the mastoid process, the middle cranial fossa and the position of the lateral sinus. Good x-ray plates are very contact essential in completing the diagnosis.

Identification of the invading organism in ear discharge is very important in all cases especially the *Streptococcus mucosus capsulatus*. The latter should be kept under careful observation and x-rayed once a week until normal should they escape early operation. The milder strains of streptococci are very frequently reported in middle ear infection and their presence should be expected. However they frequently subside and are not regarded with the same significance as formerly. Blood culture and lumbar puncture are essential procedures in advanced case with suspected complications. Urinalysis is routinely valuable and when indicating acute nephritis or diabetes directly influences diagnosis and treatment.

The differential diagnosis usually lies between furuncle, postauricular adenitis, postauricular cellulitis, postauricular erysipelas, cervical adenitis and diphtheria. Some of the conditions may very closely simulate mastoiditis but by careful elimination and due diligence to correct diagnosis can be reached. Sometimes the diagnosis is obvious and very difficult to the extent of the mere physical examination.

It is exceedingly important that the clinician between the middle ear and mastoiditis. At the present time suction treatment being employed by the middle ear. Most cases of middle ear infection clear up by the simple treatment of daily irrigation. It is however being limited by the authorities that these of middle ear and that the treatments are by suction treatment being given to the middle ear. It is not possible by suction treatment to prevent the middle ear mastoid cell when it is inflamed that the treatment may be

helpful in otitis media but surely it is a fallacy in acute diffuse mastoiditis

In summarizing I will again emphasize

1 The importance of physical signs in the diagnosis of operative mastoiditis

2 The importance of correlation of physical signs history laboratory findings and the clinical picture as a whole

3 The importance of early recognition of operative acute mastoiditis that the hearing mechanism may be protected and that intracranial complications may be avoided





## CLINIC OF DR. A. A. BRIC

### MOUNT SINAI HOSPITAL

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#### THE RADICAL OPERATIVE CURE OF GASTRIC AND DUODENAL ULCER

It is indeed a privilege to take part in a discussion on gastric and duodenal ulcer before such a distinguished society and together with such eminent company. If the expression of an Irish bull may be permitted I should say it is strange that a symposium on gastric and duodenal ulcer is necessary especially that part of it which is concerned with treatment. Gastric and duodenal ulcer are not new maladies. Unlimited opportunities for clinical observation and study of patient suffering with gastric and duodenal ulcer have been afforded us yet we have come to no conclusion as to whether medical or surgical treatment is better or whether the aim of our therapy should be palliative or directed toward that highest goal—the ideal permanent cure of the affection. This is our own fault. We will come to no conclusion on either of the important points until we systematically review the clinical histories of the patient and know their future course by means of comprehensive follow up system.

It is important that we understand what is meant by a comprehensive follow up system. This implies a periodic examination of the patient physically and by means of test meal and the x-ray. This must be done over a period of ten years. Inquiries by letter and questionnaire as to the condition of the patient are not satisfactory. It is readily conceivable that a phlegmatic individual may have very serious lesions of the gastrointestinal tract without suffering much disturbance therefrom. Therefore some of our patients came to the return clinic and

stated that he was feeling well. Close questioning however elicited the fact that he occasionally had foul smelling vom and on gastro intestinal x ray examination a gastrocolic fistula the result of a perforating gastrojejunal ulcer was found to be present. A very sensitive patient on the other hand or a neurasthenic individual may complain inordinately of distress. Careful examination of such a patient shows that he is organic well and his complaints are chiefly due to nervous disturbance.

The follow up observation therefore must be a direct one and must extend over a period of at least ten years. In our clinic we have set ten years as the period of follow up because we have found that the largest number of recurrent cases occur in the second to the fifth year after operation a fewer number from the fifth to the eighth year after operation and still fewer from the eighth to the tenth year. A patient who has remained well for ten years we consider cured.

If the follow up system is to be as broad and comprehensive as outlined above the conclusion and conflict of opinion as regards percentage of cure complications recurrences and renewed ulceration from the different methods of treatment will rapidly disappear. For these facts. A similar method of treatment must be attended with the same percentage of cures failures and complications no matter where it is employed provided it is properly administered. A few years ago Dr Lewisohn reported from our clinic a study of the patient in whom gastroenterostomy had been done for duodenal ulcer. This study showed that at least 33 per cent of them develop within a course of six or eight years a gastrojejunal ulcer or a recurrent duodenal or gastric ulcer. The high percentage of recurrent or new ulceration in regard to enterostomy was exceeded by the profession with regard to all other methods. Some might think that the high percentage of failure was due to the fact that the operation of gastroenterostomy was not properly performed in our clinic. Others might think that the high percentage of gastrojejunal ulceration following gastroenterostomy was due to the fact that we employed linen thread for the outer suture in making the anastomosis and till others could ascribe no reasonable

cause for the large percentage of gastrojejunal and renewed duodenal or gastric ulceration. As regard the question of the method in which gastro enterostomy is done in our clinic. Our technique is similar to that employed by all modern surgeons. We have taken pains to ascertain the method of other clinics and to compare our with them and they are practically identical. It is true that I have used the linen thread (Lagenstecher) for the outer layer of suture. Would that gastrojejunal ulcerations might be ascribed to the use of linen thread? How easy it would be to prevent their formation! It is true that in some of the gastrojejunal ulcers a linen thread has been found in the floor of the ulcer—and why not? If a linen thread suture has been used to make the gastro enterostomy it is extremely likely that it will be found in the floor of the new ulcer when it forms. But this does not mean the linen thread caused it because gastro jejunal ulcers occur after the all catgut method of anastomosis and after gastro enterostomy by use of the Murphy button. There is no proof available that the linen thread causes gastro jejunal ulcers rather it must be conceded that the gastrojejunal ulcer arising from other causes has simply included the linen thread in its floor.

I have stated that this report of the large number of operative failures due either to the formation of gastrojejunal ulcer or to a renewed duodenal or gastric ulceration is received by the surgical profession with a great deal of surprise. Other clinics in this country had reported only about 3 to 5 per cent of such operative failure. Shortly after the appearance of Dr. Levin's paper a report appeared from Beer's clinics announcing that they had 28 per cent of operative failures after gastro enterostomy due to gastric jejunal or renewed duodenal or gastric ulcer. Another report appeared from Payr's clinic in Leipzig giving 30 per cent of failure after gastro enterostomy. Hoheneggs clinic in Vienna reported 22 per cent failure and Van Haebe reported five a two year period of observation on a small number of cases 16 per cent of recurrence after gastric enterostomy. And here today we have heard Dr. Lahey state that after a period of observation of two

stated that he was feeling well. Close questioning, however, elicited the fact that he occasionally had foul smelling vomitus and on gastro intestinal x ray examination a gastocolic fistula the result of a perforating gastrojejunal ulcer was found to be present. A very sensitive patient on the other hand or a very neurasthenic individual may complain inordinately of distress. Careful examination of such patient shows that he is organically well and his complaints are chiefly due to nervous disturbances.

The follow up observation therefore must be a direct one and must extend over a period of at least ten years. In our own clinic we have set ten years as the period of follow up because we have found that the largest number of recurrent cases occur in the second to the fifth year after operation, a fewer number from the fifth to the eighth year after operation and still fewer from the eighth to the tenth year. A patient who has remained well for ten years we consider cured.

If the follow up system is broad and comprehensive as outlined above the confusion and conflict of opinion as regards percentage of cure, complications, recurrences and renewed ulcerations from the different methods of treatment will rapidly disappear. Facts are facts. A similar method of treatment must be attended with the same percentage of cures, failures and complications no matter where it is employed provided it is properly administered. A few years ago Dr Lewisohn reported from our clinic a study of the patients in whom gastroenterostomy had been done for duodenal ulcer. This study showed that at least 33 per cent of them developed a recurrence of ulcer 5 years after operation in a gastrojejunal ulcer, a recurrent duodenal or gastric ulcer. This high percentage of recurrent or new ulceration following gastroenterostomy is accepted by the profession with great deal of surprise. Some thought that the high percentage of our failures was due to the fact that the operation of gastroenterostomy was not properly performed in our clinic. Other thought that the high percentage of gastrojejunal ulceration following gastroenterostomy was due to the fact that we employed linen thread for the outer suture in making the new stoma and still others could not believe it reasonable

complaints some have given a good history of ulcer. Such a possible course is the ideal one. Second the ulcer may heal for a time and all its attendant symptoms disappear while it is healed. The patient and the physician think that the ulcer is cured. This result may be attained spontaneously or it may be brought about by medical or surgical treatment such as gastro-enterostomy, cautery, excision (Balfour), pyloroplasty (Finney, Halstead) etc. In this group of cases the cure is not a permanent one. Sooner or later the ulcer reopens and all the symptoms return. After a shorter or longer period of time either with treatment or without the ulcer heals again and the symptoms disappear once more. The relapse may last a shorter or longer time and so also may the intermission. Doctor White of Boston has stated here this afternoon that he prefers to treat patients with short relapses and long intermissions. So do we all. The longer the intermission the better we like it for during the period of intermission we think we have cured the patient and we are apt to attribute the cure to the particular method of treatment that has been employed. The third group includes the ulcers that remain unhealed but all the symptoms disappear for a while. The time of disappearance of all the symptoms may be shorter or longer usually the former. In this connection I need only refer to the ulcers of the lesser curvature of the stomach in which together with the disappearance of the symptoms the niche disappears from one cause or another leading us to think that the ulcer has healed. As a matter of fact the disappearance of the niche as seen by the x-ray examination does not mean that the ulcer has healed. In these patients the symptoms return in a short while and the penetration of the ulcer is again evidenced by the return of the niche.

Of course the aim of all therapy is to bring about a permanent and lasting healing of the ulcer and to achieve this end it is important to study the conditions upon which the permanent natural spontaneous radical cure of the ulcer depends.

In this connection we have to consider. First the chronic specific gastritis that underlies the formation of an ulcer. Secondly the local factor in the stomach. And thirdly the factor

and a half years he had something like 26 or 28 per cent of gastrojejunal ulcer in a comparatively small number of cases I stated above that facts are facts! Our 33 per cent of recurrences have been confirmed by the report from Berlin, Leipzig and Vienna and now today by Dr Lahey. A similar follow up system has been used in all these clinics and the end results have been the same. The percentage of operative failures must be the same in New York as in the rest of the world and it will be found the same provided the same comprehensive follow up system is used all over.

Not only must the follow up system be conducted along broad and certain lines but those who take part in the follow up system must be critical. In our own clinic the entire surgical staff of the Gastroenterological Division takes part in this institution. The advantage of many participants in the investigation consists in the fact that thereby personal prejudice is eliminated. It is conceivable that a single investigator may by his enthusiasm for a certain line of procedure overlook symptoms and complaints that others not equally prejudiced will readily detect. We set aside in our Clinic Sunday morning for the investigation of postoperative patients. The patients are brought to our follow up clinic by secretaries and by considerable effort on their part we have had the advantage of studying the postoperative course of more than 50 per cent of our patients. If the large clinics in this country will strive to study over a period of ten years the postoperative course of their patients suffering with gastric and duodenal ulcerations it will not be long before we have absolute and definite data regarding the value of the various surgical procedures in affording a cure of these diseases.

It has been stated above that the profession has come to no conclusion as to whether gastric and duodenal ulcer is better treated by intestinal or operative means. A study of the history of ulcer will help us to formulate a conclusion on this point. It will be found by such a study that ulcers may be grouped into three classes. First, a third of the patients spontaneously and remain healed. The evidence of their existence is afforded by the presence of scars. Many of these patients never had any com-

well into the body of the stomach very occasionally it extends near and even up to the cardia. With a low power microscope these polypoid infiltrations are found to consist of masses of lymphoid cells which frequently compress the gastric glands until the latter almost disappear. These lymphoid cell accumulations sometime break through and extend into the muscularis of the stomach and occasionally reach up to the peritoneal liver. The polypoid elevations persist for a shorter or longer time as

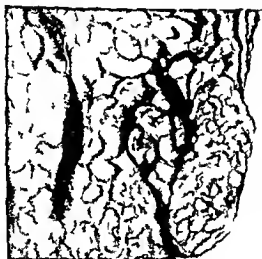


Fig 40 — Polypoid gastric ulcer with glandular infiltration. (H. P. L.)

stated above their tips may become eroded and give rise to hemorrhage and at a later period this erosion may develop into a true ulcer. Healing of the infiltration may take place with large bands of fibrous tissue extending through the lymphoid cells. But the glandular structure of the mucosa where they have been compressed and destroyed never recovers their normal relations. If complete healing takes place fibrous tissue replaces the polypoid infiltration.

Thus chronic specific gastritis is the first stage in the patho-



of infection in its relation to the causation and continuance of the ulcer

So long as we had at our disposal for the study of ulcer only such material as was obtained at the autopsy table we could have absolutely no conception of the so called *specific ulcer gastritis* for the change in the mucosa of the stomach produced by such a specific gastritis disappeared very shortly after death. The large amount of fresh pathologic material placed at the disposal of the pathologists since subtotal gastrectomy for the radical cure



Fig. 401.—Polypoid gastritis. The specimen shows a large, polypoid, ulcerated area on the mucosal surface of the stomach, characteristic of specific ulcer gastritis.

of ulcer has been practiced has enabled them to study the changes that take place in the gastric mucosa as a result of peculiar gastritis. In the early stages of a specific ulcer gastritis the mucous membrane of the stomach is studded with small polypoid elevations the size of which varies from 1 to 2 mm. If the polypoid elevations are reached with an ordinary handle which is focal distance their tops are tumorous and are abundant and are located on the seat of small superficial ulcers. The polypoid infiltration of the mucosa in this case is only the preliminary area but eventually will up to the ulcer structure.

postmortem room. Twenty minutes after the patient had died an autopsy was made and the stomach was removed and preserved for further examination. This examination showed that no ulcer was present but there was extensive polypoid infiltration of the mucosa and erosions of the tops of the polypoid structures. Dr. Max Linhorn of New York was one of the first to recognize the fact that fatal hemorrhage could result from superficial erosions of the stomach. In a recent patient of our



Fig. 404.—Histology of polypoid infiltration with glandular and fibrous tissue, dense lymphoid infiltration, and deep ulceration.

own in whom the ulcer of the lesser curvature of the stomach and an ulcer of the duodenum there was a very extensive polypoid growth a very severe postoperative gastric hemorrhage from the surface of these polypoid masses took place. The hemorrhage in this case was checked by washing

the polypoid growths with a 1% solution of epinephrine. The patient died of hemorrhage. The histological picture is that of a polypoid growth with a dense inflammatory reaction and deep ulceration.

genesis of an ulcer. As proof of such a statement we have the evidence afforded by patients who have suffered with all the symptom of ulcer and in whom on a thorough and complete exploration no sign of an ulcer is found. In a case recently recorded from Vienna (*Lancet* Archiv) there had been very profuse gastric hemorrhages extending over a number of days. The diagnosis of a bleeding gastric ulcer was made and the patient was referred to the hospital. As the bleeding continued under the expectant plan of treatment and the diagnosis of ulcer



Fig. 403.—Lymphoid infiltration composed of polypoid masses peculiar to gastric high polypoid.

seemed to be assured, an operation was undertaken to check the hemorrhage. Much to the surgeon's disgust, no ulcer could be demonstrated though a thorough and far-reaching exploration was made. The abdominal wound was closed and the patient returned to bed. Though hemorrhage continued, persistent efforts to stop it a few days after the operation failed. The patient had been notified of the possibility of his impending death and died at last, thereupon the stomach was filled with formalin solution and the body transferred to the

portion of the body of the stomach and along the upper part of the lesser curvature (The accompanying schematic diagram illustrate the way free HCl is secreted in the stomach and also the influence that various method of treatment have upon free HCl secretion) The peptic secretory activity of the acid producing gland is excited (1) by *psychic impulses* through the pneumo gastric nerve (2) by the *physical contact* with food within the stomach (3) by *hormones* elaborated in the antrum and (4) by the physical contact with food in the upper part of the jejunum.

The Usual Conception of the Mechanism of Acid Production in the Stomach ①

- 1 Afferent impulses psychic and through taste and smell
- 2 Contact of food in stomach
- 3 Hormone produced in the antrum
- 4 Contact of food in jejunum.

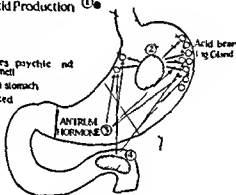


Fig 40 —The 1 pt f th m h m f d p d t  
ch t ma h l d g locat f th d be g gl d l g th l  
rv t d th f d d body

num Through one of these four ways the secretion of free HCl is brought about

When an ulcer of the stomach or duodenum is treated by an Einhorn tube the *psychic impulses* are not modified the *impulses resulting from the contact of the food* with the stomach are replaced by the contact with the tube the *hormones* of the antrum are not modified and *impulses* resulting from the contact of the food in the upper jejunum remain the same We would expect therefore that with the Einhorn tube treatment the acidity of the stomach should remain the same or be in

the stomach with ice water. Every surgeon who has much to do with gastric and duodenal ulceration has had referred to him patients with gastric hemorrhage with a clear cut history of ulcer in whom on exploration no evidence of an ulcer can be found. Such cases are all classified in the group of essential gastric hemorrhage. In our clinic we have given up this classification; all the patients whom we put into this category have sooner or later come to operation for a well defined gastric or duodenal ulcer. (The cases will be reported in a separate communication.)

From the evidence presented above we maintain that the polypoid specific gastritis precedes the formation of a well-developed ulcer and is the first step in the pathogenesis of an ulcer. The question will naturally arise what is the cause of this peptic ulcer gastritis. There are many factors which can occasion it, chief of which are faulty metabolism and inherited constitutional tendency to ulcer. The faulty metabolism can be occasioned by bad improper food as during war or epemics, exhaustion, diseases, various toxemias, etc. and the inherited constitutional tendency can be translated into a tendency to essential duodenal and faulty metabolism.

The second factor to be considered in order to achieve radical cure of ulcers is the acid factor, i.e., the free HCl. We do not know what relationhip exists between free HCl production in the stomach and ulcer, but we do know this—that ulcers do not form in an achlorhydric stomach and we might go further and say that ulcers do not form for a stomach which has been made achlorhydric. The relationhip between acid production and ulcer is extremely important.

Up to the present time every type of treatment of ulcers has taken into consideration the neutralization of the high acidity of the free HCl in the stomach. It is worth while to study the mechanism of acid production in the stomach and such the acid production must be influenced by the various types of treatment that have been or will be employed in the treatment of ulcers. The cause of the high acidity of the stomach is located for the most part in the food and in the metabolism.

portion of the body of the stomach and along the upper part of the lesser curvature. (The accompanying schematic figure illustrates the way free HCl is secreted in the stomach and also the influence that various methods of treatment have upon free HCl secretion.) The special secretory activity of the acid-producing gland is excited (1) by *psychic impulses* through the pneumogastric nerve, (2) by the *physical contact* with food within the stomach, (3) by *hormones* elaborated in the antrum and (4) by the physical contact with food in the upper part of the jejunum.

# The Usual Conception of the Mechanism of Acid Production in the Stomach

1. Afferent impulses, psychic and through taste and smell
2. Contact of food in stomach
3. Hormone produced in the antrum
4. Contact of food in jejunum

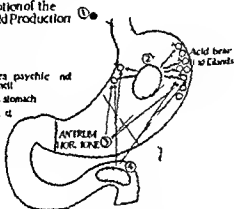


Fig. 405.—The mechanism of the production of free HCl in the stomach and duodenum. 1. Afferent impulses, psychic and through taste and smell. 2. Contact of food in stomach. 3. Hormone produced in the antrum. 4. Contact of food in jejunum.

Through one of the four ways the secretion of free HCl is brought about.

When an ulcer of the stomach or duodenum is treated by an Ehnhorn tube the *psychic impulses* are not modified; the *impulses resulting from the contact of the food with the stomach* are replaced by the contact with the tube; the *hormones* of the antrum are not modified and impulses resulting from the contact of the food in the upper jejunum remain the same. We would expect therefore that with the Ehnhorn tube treatment the acidity of the stomach should remain the same or be in

# Effect of Einhorn Tube on Mechanism of Acid Secretion

1 Not affected

— Increased because of mechanical irritation

3 Doubtful probably increased on account of mechanical irritation

4 Not affected

Total effect increased acid production which coincide with total acid afforded by titrimetric method but both in it namely marked hyperacidity

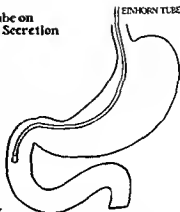


Fig 406—Schmatz's effect of Einhorn tube on the mechanism of acid secretion. N 1 2 3 4 ref. t. th. t. m. l. h. ch. t. h. f. t. f. th. d. g. l. d. d. c. a. e. d. F. g. 40

# The Effect of Medical Treatment on the Mechanism of Acid Production

1 Not affected

2 Not affected

3 Not affected

4 Not affected

Total acid not affected

Temporarily influenced by the administration of alkalis

The meals taken during Sippy and Lenhart's diet without the administration of alkalis show the same acidity

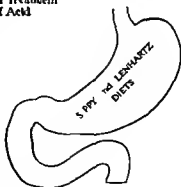


Fig 407—Effect of dietary measures on the mechanism of acid production. N 1 2 3 4 f. t. h. m. l. h. h. h. f. d. p. o. d. t. c. d. g. l. d. d. d. F. g. 40

Increased As a matter of fact it has been proved clinically by means of fractional test meal that the

When a patient with gastric or duodenal ulcer is treated by one of the forms of dietary treatment the psychic impulses through the pneumogastric remain constant the impulses excited by the contact with food remain the same the impulses from the hormones are not modified and those from the contact of food in the jejunum are likewise constant. Theoretically therefore the free HCl secretion during dietary treatment should not be modified. Clinically we find this to be the case. To overcome this constant acidity while patients are under

### Effect of Gastro-enterostomy on Acid Production

- 1 Not affected
- 2 Not affected
- 3 Not affected
- 4 Not affected

Total effect on acid production

Test meal is taken after gastro-enterostomy how hyper-acidity as before operation

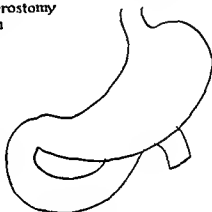


Fig 403—Shunt placed in stomach to allow food to pass from jejunum to stomach without passing through duodenum. Fig 405

long dietary treatment Sippy has added large quantities of alkalies to the diet

When gastro-enterostomy is employed for the treatment of ulcer the four factors concerned in exciting free HCl secretion are not affected. The acidity remains the same as before operation except so far as it is neutralized by regurgitation of bile and intestinal juice through the new stoma into the stomach. Clinically this has proved to be the case.

When pylorectomy is employed or even a partial antrumectomy the acid figures should theoretically be the same



CHART I

RE RE L F HCl F B AFT G ST O-  
MIE

m	Year of operation	Acid figures before operation	Acid figures after operation
1 A B	1917		45-88
2 I N	191	45-	41-6
3 M P	191	40-60	35-44
4 H L	191	53	9-5
5 H J	191	8-109	39-56
6 M F	1918	55-91	28-37
7 A D	1918	20-44	48-6
8 N R	1919		26-51
9 M R	1919	55-85	19 0 Sbt tal ga t ect my 1923 0-27
10 B G	1919	6 0	68-96
11 J G	1919	36-77	41 58
1 M H	1919	45-8	16-37

after operation as before for the stimuli excitin the secret o s  
of the acid gland a e n t mod fied by the operation In prac

### Excision of Uker Bearing Area at Pylorus or Horsley Operation

- 1 Not affected
- 2 Not affected
- 3 Not affected
- 4 Not affected

Y t l result none  
pen th sue h t m  
f t l d produ tk



Fig 409—Schma p ese f flect f f l bear g  
h ype f pyl plas y po f HCl p od ct Nos 1 2 3 4  
f t h t m t t g h f f h d gl d d ed in  
Fig 40

tice this i found to be the case The permanency of the acid  
secreti n after pyl ectomy and p rtal antrum ctomy will ac

count for the recurrence of ulcer after this type of operation. As long as the free HCl remain in gastric secretion the danger of a recurrence or the new formation of a gastric or duodenal ulcer is always a positive one.

When excision of the ulcer without by-crusty excision or the Halsted operation is employed in the treatment of the ulcer the refluxes should theoretically be the same for the stimuli exciting the secretion have not been altered. In practice this is found to be the case.

CHART II

Excision of Ulcer With or Without Cysto-Enterostomy

Case	Operation	Acid before operation	Acid after operation
D F	Excision of ulcer	0	0
J J G	Excision of ulcer with auxiliary gastroenterostomy	1	0
S	Excision of ulcer with gastroenterostomy	60	0
D B	Excision of ulcer with gastroenterostomy	40	0
J J J	Excision of ulcer with gastroenterostomy	100	0
S M	Excision of ulcer with gastroenterostomy	100	0
J J S	Excision of ulcer with gastroenterostomy	100	0
S A L	Excision of ulcer with gastroenterostomy	100	0
B D	Excision of ulcer with gastroenterostomy	100	0
O H G	Excision of ulcer with gastroenterostomy	100	0
D G	Excision of ulcer with gastroenterostomy	100	0

When resection in continuity is employed for the treatment of ulcer on the lesser curvature of the stomach so called sleeve

CHART I

R RE I F E HCl Fl L B A G O

N	Y	I per	Acid figures before	Acid figures
1 A B	1917			45-88
2 I N	191		45	41-6
3 M P	1917		40-60	35-44
4 H I	1917		53-75	29-52
5 H J	1917		8-109	39-56
6 M F	1918		55-91	28-3
7 A D	1918		20-44	4-6
8 N R	1919			26-51
9 M R	1919		55-88	1920 S bt tal g t my 193 0-27
10 B G	1919		6 0	68-96
11 J G	1919		36-77	41-58
I M A	1919		45-8	16-37

after operation as before for the stimuli exciting the secretions of the acid gland are not modified by the operation. In prac

### Excision of Uker Bearing Area at Pylorus or Horsley Operation

- N 1 aff ct d  
2 N 1 ffected  
3 Not affected  
4 Not ffected

T t l resul none  
upon the surch ism  
f id producti



Fig 409—Sch mat p esc t f ffec f cr f lee be g  
h type f pyl plas y po l HCl p od ct Nos f J 4  
f i th m l t g th f f b d gl d d t d  
Fig 40

tice this is found to be the case. The permanency of the acid secretion after pylorotomy and partial antrumectomy will ac



resection we find that the resulting secretion of gastric juice is antacid. It is difficult to explain this occurrence. Theoretically the stimuli remain the same after operation as they were before but it has long been my opinion that there is a center presiding over acid secretion and that this center is located at or near the re-entrant angle of the stomach on the lesser curvature. When sleeve resection is employed this center or its nervous connections are destroyed or removed and consequently an achlorhydria results. This explanation would also account for the

### Effect of Sub Total Gastrectomy on Acid Production

1. Not affected

2. Doubtful

3. Entirely removed

4. Not free

Total result marked

75% of patient — No free

HCl after operation

10% of patient — Free

HCl below 10

Antrum most important

factor in

mechanisms of acid

production



Fig. 410 — Schematic representation of effect of subtotal gastrectomy on free HCl production. Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

achlorhydria that follow upon excision of ulcer on the lesser curvature.

When subtotal gastrectomy is employed for treatment of gastric and duodenal ulcer the gastric secretion becomes achlorhydric in about 80 per cent of the patient. The stimuli which are excited through the four channels enumerated above are profoundly influenced by this operation. The psychic impulses remain constant but these impulses excited by the contact of food in the stomach and by the hormones elaborated in the antrum are entirely done away with. And the hypothetical center on the lesser curvature which presides over acid secretion is

CHART III

ACHYLIA GASTRICA UPON DISCHARGE AND UPON RE-ENTRY

No.	Name	Date of operation	Location of ulcer	Food consumption		
				Before	After	After
4	A.P.	Dec 1922	Gastric	20-7	0-10	0-1
12	C.S.	May 1923	Duodenal	Nothing obtained	0-0	0-1
4	D.B.	Dec 1923	Duodenal	65-86	0-30	0-19
25	S.T.	Dec 1923	Duodenal	3-55	0-30	0-1
26	S.G.	Dec 1923	Duodenal	42-74	0-30	0-20
30	H.C.	Jan 1924	Pyloric	45-80	1-36	0-10
3	M.D.	Jan 1924	Duodenal	50-0	0-25	0-1
39	H.B.	May 1924	Pyloric	60-81	0-30	0-1
51	J.G.	Dec 1924	Duodenal	8-94	0-10	0-16
56	J.G.F.	Dec 1924	Gastric	50-60	0-0	0-16
58	M.F.	Dec 1924	Duodenal	33-54	0-30	0-16
62	L.L.	Jan 1925	Duodenal	70-90	0-5	0-41
65	A.K.	Feb 1925	Duodenal	40-65	0-30	0-14
74	M.F.	Apr 1925	Gastric	15-29	0-0	0-19
75	B.L.	Apr 1925	Gastric	40-65	0-1	0-15
77	M.S.	Jan 1925	Gastric	22-20	0-15	0-15
81	H.C.	Aug 1925	Duodenal	20-62	0-32	0-16
85	S.G.	Oct 1925	Duodenal	79-97	0-37	0-8

likewise removed. The absence of free HCl after subtotal gastrectomy has been controlled in these patients by the neutral red test and by fractional test meals.

I have stated already that the presence of free HCl in gastric secretion bears a strong relationship to the formation of ulcers of the stomach and duodenum. I have also stated that every type of treatment that has been employed in the treatment of gastric and duodenal ulcers has taken into consideration the neutralization or the dealing away with this free HCl. Thus the internal treatment in addition to diet liberally uses large quantities of alkalis. Einhorn tube treatment designed by putting the stomach at rest (?) to diminish the acid secretion. Gastro-enterotomy was thought to bring about neutralization of the gastric content by favoring a reflux of alkaline bile and intestinal juices through the new stomal into the stomach. The

The neutral red test described by D. W. Allen is a test for gastric acidity. It is based on the fact that the neutral red dye is colorless in acid solutions and pink in alkaline solutions. The test is performed by placing a small amount of the gastric contents in a test tube and adding a few drops of the neutral red dye. If the solution turns pink, it indicates the presence of free HCl. If it remains colorless, it indicates the absence of free HCl.

## CHART IV

S C I R I S U G G J JCNAL  
RE L R D L

	A t t i r e p a r m	16-ures h i r e r a t p e f a	P l b l r e c	A c f i g u r e s p e
I	C m-e e r m p l c e	0-60	P l g a s r e c t o r m f o r r e- c u r r e n t g a s r e c k	0-2
III R	9- l P l e c t f o e	0-4	l g a r e c l e	0-2
IV	m-e d t l r e c	1	P l g a r e c t d u o l c e	0-
	R m o 0-00 F r o-e d o d r e t	2	l g a s r e c t o r m f o r r e- c u r r e n t	0-
V	k r o-e r o n		S l a s r e c t f r e c	0-
V	0-6 G r o-e r o n l o l		l g a s r e c t f r e c	0-
V	l o-e r o n d u o l		l g a s r e c t f r e c	0-
V	l r o-e r o n d u o l	-4	m l g a s r e c t o r m f r e c	0-
	l r o-e r o n d u o l			
	l r o-e r o n d u o l			
	l r o-e r o n d u o l			
L. h	d o l r o-e r o n d u o l	-4	r e c l a s r e c l r e c	0-

only method of treatment however that brings about a permanent and lasting acidity of the gastric content is total gastrectomy. At the beginning of this chapter it is stated that ulcers do not form in an antacid medium and do not recur where the medium has been made antacid by the addition of hydrochloric acid. This is a well known fact to make perfectly clear that a common impression with the teaching of emesis is that the subject that in about 5 to 10 per cent of the cases of the stomach and duodenum the gastric secretion is antacid. This impression and teaching are not based on a careful examination of the gastric contents. If you will examine the history of ulcer patients you will find that they have no free HCl in the gastric contents and in fact we have not encountered a single ulcer patient. In the past three years I have gained the impression that ulcer is a chronic disease the formation of ulcers is not a transient phenomenon but a

from the teachings of our predecessors and not from our own clinical experience. This important fact needs further confirmation.

The third condition upon which the permanent cure of gastric and duodenal ulcer depends is that of infection. It is utterly immaterial to the question under discussion whether we consider this infection as secondary to a distinct focus *e.g.* in the teeth the appendix gall bladder etc. the so-called focal theory of infection or whether we consider the infection a primary one. The important fact to be remembered is that the established ulcer of the stomach or duodenum is always an infected lesion. The infecting organism is usually the *Streptococcus viridans*. The erosions in the stomach that have formed on the surface of the polypoid elevations described above become infected sooner or later with this green streptococcus and when such infection takes place the story thereafter is essentially the story of infection. Let me illustrate this point. In the active period of an ulcer is the symptom period the ulcer area is edematous infiltrated with leukocytes the peritoneal surface of the ulcer is covered with fibrin and the floor of the ulcer is covered with necrotic fibrinous material. The edema the leukocytic infiltration the fibrinous involvement of the peritoneum are entirely dependent upon the severity of the infection. In the milder form of the infection more in the excretory. Do not these pathologic changes in and around the ulcer bear the strong resemblance to the changes occurring in an acutely infected lesion of the appendix or gall bladder and just a perforation of the appendix or gall bladder is our pathologic type of acute infection of the organ. Many perforations hemorrhage (when the infection is in the blood vessel in the floor of the ulcer) the fibrin lining the ulcer is the ulcer. A further history of the ulcer is that in infection there are frequent attacks of other subjective symptoms. When the period of infection subsides the changes that take place in the ulcer are again similar to those that are found in the infected gall bladder that have been the seat of a previous attack of acute infection thus the edema



around the ulcer subsides and is replaced by dense fibrous tissue. The fibrin covering the surface of the ulcer disappears and is replaced by organized adhesions and the floor of the ulcer is covered by fibrous tissue the remains of the inflammatory exudate which covered it during the active period. The picture as given above is that which any surgeon who deal with ulcer can testify to. And surely it correspond in every detail with the picture afforded by an acutely inflamed appendix or gall bladder.

The factors that have been considered above namely the specific gastritis the free HCl secretion and the infection lead us now to formulate the definition of an ulcer. An ulcer is an infected erosion the latter resulting from a specific gastritis in the presence of free HCl.

It is important now to apply the considerations discussed above to the treatment of ulcer. To bring about a lasting permanent cure of ulcer it is important that we deal away with the condition that has been essential in its formation namely the chronic specific gastritis the free HCl and the infection. The internist relies upon the natural tendency of the ulcer to heal he tries to prolong the period of healing by dietary and medical means. Some internists insist that patients with ulcer should observe strict dietary regulations for a year after an active period of symptoms. Surely this year cannot be out of the actual healing of the ulcer so this latter take place within a period of four to six weeks. The period of the year is for the most part designed to alleviate or cure the chronic specific gastritis. When the ulcer is recent (in our own clinic we have set four months as the period) the probability of bringing about a lasting cure of the specific gastritis and the resulting ulcer is very good. Hence we reserve for medical treatment those cases whose clinical history is less than six months. This fact enables us to understand the difference between the results accomplished by medical treatment in private practice and in dispensary practice. Private practice is more apt to apply to treatment a period much less than six months from the beginning of the symptom whereas the dispensary patient is more likely to bear their suffering for a long period before applying

ing for treatment. Most internists are very insistent upon the long continuance of dietary regulation after healing of an ulcer has taken place. Patients however are not angels and do not follow to the letter the instruction of their medical advisers. The first thing an ulcer patient does after the ulcer is thought to be healed and the pain and suffering have ceased is to test out the cure. At first he cautiously nibbles and tastes of forbidden article of food. When such deflections from the dietary regulation occasion no pain he tries a little more and then a little more until he eats everything. It is folly to believe that an ordinary individual will follow strict dietary laws for any such time as a year. His statement to the contrary notwithstanding. We reserve then for our medical treatment

CHART V

REMOTE RESULTS OF MEDICAL TREATMENT IN PERCENTAGES

	R	A	E						
			W						
1922	22	4	YR	273	227	91%	318%	91%	45%
1923	17	3		412	235	59%	235%	0	59%
1924	30	2		566	10%	66%	233%	0	33%
1925	32	1		675	22%	94%	11%	0	0

these recent cases of ulcer whose history has been shorter than four months and in order to be perfectly fair to all patients where there is no urgency for operative interference we advise all patients who have never had the benefit of a thorough medical cure to undergo *such treatment* before resorting to operative interference. The result that has followed this medical treatment of ulcer is well shown by the follow up work at Dr Crohn's clinic at the Mount Sinai Hospital (Chart V).

A more comprehensive follow up of the results of medical treatment given by Dr Nielsen in the Acta medica Scandinavica and is shown in Chart VI (page 1189).

As regards the operative treatment of gastric and duodenal ulcer it is natural for us to expect that the operation which he is to undergo will effect a radical and lasting

around the ulcer subsides and is replaced by dense fibrous tissue. The fibrin covering the surface of the ulcer disappears and is replaced by organized adhesions and the floor of the ulcer is covered by fibrous tissue the remains of the inflammatory exudate which covered it during the active period. The picture as given above is that which any surgeon who deals with ulcers can testify to. And surely it corresponds in every detail with the picture afforded by an acutely inflamed appendix or gall bladder.

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undertaken. Among such forbidding physical conditions are as anced tube culosis, serious coronary artery disease, and extreme cardiovascular degeneration. There is a great many patients in whom the ulcerated process at the pylorus is so extensive that it is impossible to remove it without the loss of a permanent end and in whom the healing process has been complicated by cicatricial contraction of the pyloric ring or other parts of the stomach. The result of such cicatricial deformity is a disturbance of motility. The patient no longer suffers with the ulcerative condition but with the disturbance in motility due to cicatricial deformity and any procedure which restores normal gastric motility, whether it be a gastroenterostomy or a pyloroplasty, is strongly indicated.

The second type of operation is the radical or total gastrectomy. This operation removes the source of the gastric acid, with the free hydrochloric acid and the bacteria which cause infection in the stomach. It thus satisfies all the conditions which are essential to bring about a permanent and lasting cure. I have operated on 400 patients in whom subtotal gastrectomy has been performed. There has been to date no recurrent or new formation of ulcers. Occasionally a patient will complain of some digestive symptoms such as constipation, light epigastric oppression, but there has been no pain in relation to meal, no vomiting, no heartburn, no loss of weight. We permit these patients to eat as they wish. We ask them to avoid the most indigestible articles of food, but sometimes they do and more frequently they do not, but there does not seem to be any bad results from this. I have often been asked whether we had any difficulty in determining the condition of the mucous membrane in the stomach several years after a subtotal gastrectomy. I have had been done. Inasmuch as I never had an autopsy on a patient I was unable to give any information on this point. About five weeks ago the opportunity of examining a patient who had presented itself. A patient in whom I had performed a total gastrectomy ten years before for an ulcer of the first part of the duodenum who had been entirely well up to a few weeks ago presented himself complaining of severe epigastric pain and a loss of weight. He was examined and found to have a large

cure of his malady. If the patient is informed prior to the operation that the chances for recurrence of the disease are at least 30 per cent it is very likely that he will decline operative treatment. The operations that are performed for gastric and duodenal ulcer can be divided into two groups: (a) the *palliative group* and (b) the *radical curative group*. In the first or palliative group are included those procedures which do not move the condition which were mentioned in the preceding portions of this paper as essential for effecting a lasting and permanent cure. They do not remove or cure the specific ulcer, a triti-

# CHART VI

Ultimate Results of Gastric and Duodenal Ulcer  
in 50 Cases of Duodenal Ulcer

Duration of ulcer	Permanently cured	Transiently cured	Not cured	Dead
1 year or less	10	0	0	0
1 year or more	0	0	0	1
1 year or more	0	10	0	1
1 year or more	0	0	0	0
1 year or more	0	0	0	0
1 year or more	0	0	0	1

they do not permanently relieve or do away with the free HCl production that does not put an end to the infected condition of the gastric mucosa. The method that they aim to do is to relieve the acidity by faecal regulation of intestinal contents through the new stoma into the stomach or through a wide opening at the pylorus into the stomach. In this group are included the *operation of gastrostomy with or without pyloric excision*, *excision of the lesser curvature with the knife or by caustic* (Balfour), *pyloroplasty*, *anastomosis*, *Halsled*, *Günther*, etc. We reserve this type of operation for those patients whose physical condition absolutely forbids a radical procedure being

undertaken. Among such forbidding physical conditions advanced tuberculosis, serious coronary artery lesion, extreme aortic and extreme cardiovascular degeneration. There is a great up and down in whom the ulcerated process at the pylorus has led to a permanent enlargement in whom the healing process has resulted in cicatricial contracture of the pyloric ring or other deformities of the stomach. The result of such cicatricial deformities is a disturbance of motility. These patients no longer suffer with the ulcerative condition but with the disturbance of motility due to cicatricial deformity and any procedure which restores a normal gastric motility, whether it be a gastroenterostomy or a pyloroplasty, is strongly indicated.

The second type of operation is the radical or curative one, namely, subtotal gastrectomy. This operation removes the ulcer gastritis does away with the free hydrochloric acid and removes the infection in the stomach. It thus satisfies all the conditions that are essential to bring about a permanent and lasting cure. In over 400 patients in whom subtotal gastrectomy has been done there has been to date no recurrent or new formation of ulcer. Occasionally a patient will complain of some dyspeptic symptoms such as constipation, slight epigastric oppression. There has been no pain in relation to meals, no vomiting, no heartburn, no loss of weight. We permit these patients to eat a regular diet. We ask them to avoid the most indigestible articles of food. Sometimes they do and more frequently they do not but there does not seem to be any bad result from such indulgence in diet. I have often been asked whether we had any data bearing on the condition of the mucous membrane in the stump of the stomach several years after a subtotal gastrectomy for ulcer has been done. Inasmuch as I never had an autopsy in such a patient I was unable to give any information on this point. About five weeks ago the opportunity of gaining such information presented itself. A patient in whom I had done a subtotal gastrectomy seven years before for an ulcer of the lesser curvature and who had been entirely well up to a few weeks ago presented himself complaining of severe epigastric pain, vomiting and loss of weight. His gastric content was antacid. In x-ray

examination of the stomach showed the suspicious shadow of a new growth in the stump of the stomach. It was my impression that the patient had a carcinoma in the stump of the stomach and I advised immediate operation. On opening the abdomen and separating the adhesions I found an elastic neoplasm in the interior of the stomach. It felt soft and tense. I opened the stomach on the anterior wall and found a long polyp twice as wide as the index finger and as long as the latter coming from the posterior wall of the mucous membrane behind the stomach and protruding through the stomach into the jejunum. The neoplasm was a benign one. The symptoms were due to the occlusion of the stomach by the prolapsed polyp. I excised the polyp and took occasion to remove several pieces of mucous membrane in the fundus and body of the stomach. The microscopic examination of these sections of mucous membrane showed that the glandular structure is perfectly normal and intact. The acid producing glands are perfectly normal and intact, the acid producing cells perfectly normal. We must infer from the intact condition of the mucous membrane and acid cells that the achylia results from a lack of stimulus to the acid cells.

It is important to know the direct operative mortality of subtotal gastrectomy. From November 1, 1924 to November 1, 1925 I performed 13 primary subtotal gastrectomies, 11 secondary subtotal gastrectomies with 5 deaths, a mortality of 59 per cent. From November 1, 1925 to May 1, 1926 I performed 63 primary subtotal gastrectomies with 3 deaths to which must be added one patient who as a result of a general anesthetic developed a cerebral hemorrhage which caused his death. Evidently this death cannot be put down to the operative procedure but is to be attributed to the anesthetic. 63 primary operations with 3 deaths or 4.6 per cent mortality. There are in the last period 13 secondary operations with 3 deaths, all of which were pneumonia, due to the infection of the stump of the stomach produced by a patient drinking 2 quarts of ice water from his ice bag immediately upon being returned to bed after the operation and then died from cerebral hemorrhage.

holm We have in the last period 63 primary ulcers treated with a mortality of 4.6 per cent and 113 ulcers after operation for gastrojejunal ulcer etc some of whom had been operated four or five times before with a mortality of 11.5 per cent The difference between the two is a striking one and it brings up the important question—Is it right to do palliative operation first and then a secondary subtotal gastrectomy with a much higher mortality knowing as we do that one third of the patients in whom a palliative operation is done will sooner or later require a subtotal gastrectomy? The proof of the pudding is in the eating, is an old adage and a true one Before I made a subtotal gastrectomy the operation of choice for the radical cure of gastric and duodenal ulcer I had to beg my colleagues on the internal division of the hospital to refer patients to me for operation. Their answer was a smile and a pointing to the cases of recurrent gastrojejunal ulcer that were always present in their wards They told me I substituted for the duodenal ulcer a much more rebellious ulcer at the new stomach and they preferred to treat their patients by internal and dietary means Since we have adopted the operation of subtotal gastrectomy there are no more recurrent or new gastrojejunal ulcers following operation The ward no longer contains the evidences of our own surgical failure I do not have to beg them to send me their cases for operation They have been convinced that subtotal gastrectomy really brings about a radical cure of the ulcer When by internal means they do not bring about a cure or relief they at once refer these patients for operative radical cure Let me repeat that up to the present we have not had a single case of recurrent or renewed or new ulcer in the stomach or duodenum following the operation of subtotal gastrectomy





CLINIC OF DR. CHARLES F. FARRAR  
ELIZABETH BRADLEY

NEW YORK CITY

APPENDICITIS IN CHILDREN AN ANALYSIS OF CASES  
FROM ST. MARY'S FREE HOSPITAL FOR CHILDREN  
AND THE FIRST SURGICAL (CORNELL) DIVISION OF  
THE NEW YORK HOSPITAL

APPENDICITIS in children is rather difficult to diagnose and therefore is usually considered less frequent than in adult years. There is no doubt that a very large number of minor attacks of appendicitis especially in young children are overlooked entirely or diagnosed as some other condition. In addition to acute inflammations we find in early infancy and from then up very marked chronic changes in and about the appendix which are usually styled chronic appendicitis when seen in adult years.

Numerous writers have commented on the fact that even in stillborn infants or in immature fetuses the cecum, the ascending colon and the appendix are present in considerable percentage. There is no doubt that this condition should not be called chronic appendicitis in that it implies an inflammation of the appendix whereas the true condition is a crippling of the appendix by its abnormal position and by the stresses and strains placed upon it through various bands and kinks. In this way the normal peristalsis of the appendix is unquestionably interfered with severely and the result is retention of fecal matter stagnation and irritation. In the most severe instance there will be true inflammation with definite changes in the tissues corresponding to the advanced state of the pathology. It would be far better if the term chronic ap



this investigation is the examination of an appendix which appears perfectly innocent at its first inspection. If this appendix be lifted up a bit from its normal position and stroked gently with the gloved finger once or twice an amazing change takes place. The organ becomes shorter thicker and tender. Its vessels become markedly congested in places and in other are blanched out by the extreme spasmodic contraction. The appendix within two or three minutes will assume the appearance of a moderately severe inflammatory attack. This will subside within a comparatively short time if no further irritant is offered. This is mentioned simply to illustrate the fact that the appendix can and does change its appearance with extreme rapidity. Undoubtedly some similar changes occur after the trauma of repeated examinations through the intact abdominal wall. It is probable also that many of the milder attacks of appendicitis and appendicular colics are of a similar nature with a complete resolution in a very few hours.

In our series at St. Mary's Free Hospital for Children and the First Surgical (Cornell) Division of New York Hospital there is an increasing frequency of incidence of appendicitis both acute and chronic with the increase in years but we feel very strongly that this is due to the fact that infants and young children do not readily make their minor complaints known to their parents or their physician. Certainly the pathologic findings at operation in a very large majority of the cases would indicate that a number of previous attacks had occurred.

The diagnosis of appendicitis in children is more difficult than it is in adults. This is because of the difficulty of eliciting an accurate history and because the physical examination requires far more skill than in adult years. Appendicitis must be differentiated from simple colic, ileocolitis, intussusception, pyelitis, cyclic vomiting, tuberculous peritonitis and retroperitoneal lymph nodes, acute mesenteric lymphadenitis, stone in the kidney or tuberculous kidney and very rarely gastric crise.

There is no royal road to making this differential diagnosis and undoubtedly in many instances it is impossible to arrive at an accurate conclusion. It has been my habit therefore where

pendicitis were used only for those appendices in which definite evidence of inflammation is found microscopically. The other type should be called crippled or irritable appendix.

One can scarcely doubt that these are genuine lesions especially when a large series is followed up for considerable period of time after operation. In all probability exceptionally vigorous healthy children will be troubled comparatively little by these bands and kinks of the appendix and the adjacent bowel whereas the neurotic irritable child who is under par physically as well will suffer excessively from reflex disturbances of the digestion and from very marked constipation. In addition in a certain number of children there will occur the clinical syndrome of cyclic vomiting. This does not by any means imply that all instances of cyclic vomiting are due to chronic appendicitis or to bands about the colon. There is no place to go into the origin of these bands and abnormal positions of the appendix and colon in this paper. A great deal has been written upon the subject. It is highly probable that they are not of inflammatory origin at all.

Leveuf does not believe in the inflammatory origin of the bands, veils, films and membranes which are commonly described under the name of chronic pericolitis. In more than one third of all necropsies performed on newborn infants he found definite evidence of this condition on the right colon. Indeed all of the conditions have been found in newborn infants and this is in agreement with the fact that the membranes do not have an inflammatory structure precisely that they are congenital.

In recent years the senior author of this article has taken an especial interest in examining the appendices of little children on every possible occasion either through direct attack upon the appendix or incidental to an operation for hernia, a laparotomy of any form or position. It is extremely interesting to note the high percentage of serious involvement of the appendix and especially to note that so many of these cases give few or no clinical signs. Another point of note is the fact that

tom for several days or even a week and has even suffered some considerable pain before the alleged onset when the child is severely tricken and has to stay in bed. The ordinary child will play as long as he is able to stand up whereas in the modern days an adult who has the like symptom in his abdomen is almost sure to consult at once in his family physician. It is scarcely believable that a pathologic process involving the growth of bacteria and the tissue changes such as are seen in appendicitis could take place very much more rapidly in a child than in an adult. Certainly this is not true of external lesions which can be observed with reasonable care. It is probable that some slight difference exists in that the tissues of the child react much more sharply to the insult of infection but the progress of the disease in our opinion is very little more rapid than that seen in adult cases.

The physical examination of an infant or child is a matter requiring extreme gentleness, sympathy and genuine interest on the part of the physician. He must put himself completely in rapport with the child's mental and physical state in order not to frighten the child and thus destroy any confidence he may have in his physician friend. It is of tremendous importance when ever possible to examine an infant or young child while he is asleep. If this be done with great accuracy information can be obtained as to the genuineness of muscular rigidity and tenderness and also as to the existence of an intra abdominal mass. Needle tests in children as in adults are always wiser to be in the examination on the left lower quadrant and to progress gently to the left upper quadrant than the right upper quadrant and last of all the right lower quadrant. If one begins with the right lower quadrant and the child is a tender aged child with a rough hand or even innocent he will get no further true information out of that child.

Two series of cases of appendicitis in children have been compiled one from the records of St. Mary's Free Hospital for Children the other from New York Hospital First Surgical (Connell) Division in New York City and the results have been analyzed as to age, sex, umbilicus and use of leather casts of abscess

a child could not be kept under skilful observation by a competent physician at all time to advise an operation whenever there was an attack at all suggestive of appendicitis. Everyone knows the clinical signs. The pain starting usually in the epigastrium and finally settling in the right lower quadrant the vomiting the moderate fever the fairly rapid pulse the tenderness and rigidity the prostration the leukocytosis and the polymorphonuclear leukocytes. Any one of these symptoms may be absent in genuine attack of appendicitis. In fact they may all be absent but this is fortunately extremely rare. If one or more symptoms have been present and especially if the attacks have been repeated it is highly advisable to have an exploratory operation in the interval. No harm will result and unquestionably a life may be saved in this way which might otherwise be sacrificed to a policy of delay. It cannot be emphasized too strongly that in the doubtful case the operation should be an exploratory one with ample exposure and a careful examination for any of the serious lesions which are so commonly found in childhood. If the condition will allow the appendix should be removed even though it appears normal at the operation. A careful microscopic study should be made but too much stress should not be laid upon this. In a certain number of instances complete relief of symptoms is had by the removal of an appendix which microscopically is free of lesions. The final proof of the diagnosis should rest upon the follow-up. If the child does not have further attacks similar to those previously complained of and if his impulses in general health are reasonable to believe that the appendix was at fault.

A word as to history taking in appendicitis in children. In an infant only the words of the nurse or the parents can be obtained and naturally this cannot express what is actually going on in the infant abdomen. In our clinical experience however a careful careful and persistent questioning will frequently throw much light upon the history. In the history taken of the explanation for the alleged predisposition of the disease in children is compared with that of the adult. A careful question will frequently bring out the fact that the child has had a long

toms for several days or even a week and has even suffered considerable pain before the alleged onset when the child is severely stricken and has to stay in bed. The clinical child will play as long as he is able to stand up whereas in these modern days an adult who has the slightest pain in his abdomen is a most sure to confide at once in his family physician. It is scarcely believable that a pathological process involving the growth of bacteria and the tissue change such as are seen in appendicitis could take place very much more rapidly in a child than in an adult. Certainly this is not true of external lesions which can be observed with reasonable care. It is probable that some slight difference exists in that the tissue of the child reacts much more sharply to the insult of infection but the progress of the disease in our opinion is very little more rapid than that seen in a adult year.

The physical examination of an infant or child is a matter requiring extreme gentleness, sympathy and genuine interest on the part of the physician. He must put himself completely in rapport with the child, mental and physical state in order not to frighten the child and thus destroy his confidence which may have in his physician friend. It is a formidable and almost impossible to examine an infant or a very young child while he is asleep. It may be done with great care much information can be obtained as to the genuineness of muscle spasm rigidity and tenderness and also to the existence of an intra abdominal mass. Needless to say in children as in adults it is always wise to begin the examination on the left lower quadrant and to progress gently to the left upper quadrant then to the right upper quadrant and last of all the right lower quadrant. It is begun with the right lower quadrant and to the right lower appendix with a rough hand to verify or he will get no further true information out of the child.

Two series of cases of appendicitis in children have been compared one from the records of St. Mary's Free Hospital for Children the other from New York Hospital, First Surgical (Cornell) Division in New York City and the results have been analyzed as to age, sex, number and cause of deaths, sites of abscesses



a child could not be kept under skilful observation by a competent physician at all time to advise an operation whenever there was an attack at all suggestive of appendicitis. Everyone knows the clinical signs. The pain starts usually in the epigastrum and finally settling in the right lower quadrant, the vomiting, the moderate fever, the fairly rapid pulse, the tenderness and rigidity, the prostration, the leukocytosis and the polymorphonuclear. Any one of these symptoms may be absent in a genuine attack of appendicitis. In fact they may all be absent but this is fortunately extremely rare. If one or more symptoms have been present and especially if the attacks have been repeated it is highly advisable to have an exploratory operation in the interval. No harm will result and unquestionably a life may be saved in this way which might otherwise be sacrificed to a policy of delay. It cannot be emphasized too strongly that in these doubtful cases the operation should be an exploratory one with ample exposure and a careful examination for any of the various lesions which are so commonly found in childhood. If the condition will allow the appendix should be removed even though it appears normal at the operation. A careful microscopic study should be made but too much stress should not be laid upon this. In a certain number of instances complete relief of symptoms is had by the removal of an appendix which microscopically is free of lesions. The final proof of this diagnosis should rest upon the follow-up. If the child does not have further attacks similar to those previously complained of and if his improvement in general health is reasonable to believe that the appendix was at fault.

A word as to history taking in appendicitis in children. In infants only the word of the nurse or the parent can be obtained and naturally this cannot express what is actually going on in the infant's abdomen. In young children history is a tactful, careful and persistent question of quality, rather than much light upon the history. In the history taking let the explanation for the delayed rapid progress of the disease in young children be compared with a fault. A careful question will frequently bring out the fact that the child has had aague vom-

tom for several days or even a week and has even suffered some considerable pain before the alleged onset when the child is severely stricken and has to stay in bed. The ordinary child will play a long time as he is able to stand up whereas in these modern days an adult who has the slightest pain in his abdomen is almost sure to confide at once in his family physician. It is scarcely believable that a pathological process involving the growth of bacteria and the tissue changes such as are seen in appendicitis could take place very much more rapidly in a child than in an adult. Certainly this is not true of external lesions which can be observed with reasonable care. It is probable that some slight difference exists in that the tissue of the child reacts much more highly to the insult of infection but the progress of the disease in our opinion is very little more rapid than that seen in adult years.

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Two series of cases of appendicitis in children have been compiled, one from the records of St. Mary's Free Hospital for Children the other from New York Hospital, First Surgical (Connell) Division in New York City and the results have been analyzed as to a certain number and cause of death cases of abscess

and peritonitis pulse temperature blood count symptoms complication sequelæ etc

The series from St Mary's includes those cases admitted between January 1918 and October 1921. That from New York Hospital extends from January 1915 to October 1921. There were 78 cases of children from one to fifteen years inclusive in the St Mary's series and 607 cases from New York Hospital aggregating 889 cases. It has been interesting to compare these two series with a series from the children's Surgical Service of Bellevue Hospital reported by Dr Fenwick Beckman in the *Archives of Pediatrics* December 1923.

**Sex**—Of the St Mary's cases 143 were boys and 144 girls as compared to Doctor Beckman's findings that males greatly predominated. The New York Hospital series was divided into acute and chronic cases for convenience of analysis and of 143 chronic cases 49 were boys and 96 girls of the 457 acute cases 21 were boys and 186 girls or 53 per cent boys and 47 per cent girls of a total of 607 cases. In the other two series there were nearly as many girls as boys.

**Age**—In the St Mary's series the incidence did not vary greatly from nine to twelve years inclusive. Very few cases over twelve are taken at St Mary's. The largest number of cases occurred at eleven years—38 cases or 13 per cent of the total. In Doctor Beckman's series it was found that incidence was rare under five years. At St Mary's there were 67 cases of nine years and under or 21 per cent of the total 78 cases. At New York Hospital of the 143 chronic cases the greatest number occurred at fifteen years—37 or 26 per cent. There were only one chronic case at fifteen years and none under. This was to be expected due to the difficulty of obtaining a history from young children. Of the 457 acute cases the largest number came at fourteen years with 58 cases or 12 per cent but there were very little variation between nine and fifteen. There were 2 cases fifteen years and under. The tables show that the incidence of the disease

**Deaths**—In the series from St Mary's there were 14 deaths a mortality rate of 9 per cent from the acute and chronic cases.

taken together. This was slightly lower than the 1.58 per cent death rate shown by the Bellevue series. Of the 17, 8 were girls and 9 were boys, whereas in the Bellevue series the mortality rate for girls was twice as high as for boys. Ten of the 17 were children six years or over, or 29 per cent of the 725 cases of that age limit, and 7 of the deaths were in children five years and under, or 9 per cent of the 67 cases of that age reported. The average age of those who died was six and five tenths years. The average time from onset of symptoms to time of operation was two and nine tenth days. The symptoms were naturally more marked than in the less severe or chronic case. All except one had vomiting, whereas in the milder case there was frequently only nausea, although in the younger cases it was difficult to elicit a history of nausea. All the cases had severe pain, tenderness, and rigidity in the right lower quadrant, and all looked extremely toxic. At operation or at autopsy it was found that 10 of the 17 cases had perforated gangrenous appendices, of which 2 had formed localized abscesses. There was one case of postoperative appendicitis in which the coils of gut were adherent to the old scar of the right rectus incision and had become gangrenous. There were 4 cases of acute appendicitis with no apparent perforation. Of these one died of pneumonia and empyema, and 3 of general peritonitis. One case died of pneumococcus peritonitis accompanied by lobar pneumonia, one died before operation, and no autopsy was obtained, one died two months postoperative of general peritonitis and lobar pneumonia. Culture of the appendix were reported positive in 12 of the 17 cases, no record of culture was made in those remaining. The cultures were usually mixed and were reported as *Bacillus coli* and *staphylococcus*, or as Gram negative bacilli and Gram negative and positive cocci. Two showed pure culture of streptococcus, one pneumococcus alone, two more showed diplococcus with *staphylococcus* and *streptococcus*, and one showed *B. mucosus capulatus*. Of the 17, death occurred before operation, of the remaining 15, 12 died within the first eight days postoperative, 1 lived twelve days, 1 twenty four days, and 1 two months. The cause of death in 16 of the 17 cases was

toemia from spreading peritonitis. One died eight days post operative from lobar pneumonia and empyema and the culture from the chest fluid showed staphylococcus. Of the 16 cases with peritonitis 7 developed pneumonia 1 with lung abscess. One case showed myocardial failure with rapid weak pulse cyanosis and dyspnea.

As stated above the one of cases at New York Hospital was divided into 145 chronic and 45 acute cases. The case was notable among the chronic cases and 22 deaths among the acute cases. That gave a mortality rate of 48 per cent among the acute cases or 36 per cent for the whole series of acute and chronic cases taken together. The 22 cases were evenly divided between males and female—11 of each. There were 3 deaths from the 23 cases of five years and under a rate of 13 per cent and 19 deaths from the 59 cases of six years and over a rate of 32 per cent. The most usual length of time from onset of symptom to operation was ten days the longest time was two weeks and the patient was brought to the hospital in moribund condition the second time to the hospital. The short interval between the symptom and the operation were all marked as might be expected in proportion to the severity of the attack. Fifteen of the 22 gave a history of vomiting. Indigestion and anorexia were the symptoms. A notable feature. All had rigidity and tenderness in the right lower quadrant. It was stated that 3 had been given cathartics. The temperature, pulse and blood count were high in most cases. The highest temperature was 104.4 F the lowest 98.4 F in a m. but the average was 102 F. The highest pulse rate was 160 the lowest 96 and the average was 120. The highest blood count was 26,000 per cent nuclei 50 per cent and the lowest 10,000 per cent nuclei 33 per cent. The incidence of death in all except the cases of pneumonia from acute general peritonitis too few in all to be reliable. The one exception was a case of multiple abscesses of the liver. Besides the peritonitis there were several additional complications. The patient died with a blood count of 10,000 per cent nuclei 33 per cent.

coccus 2 cases of abscess of the abdominal wall and 5 cases of multiple abscess of the abdominal cavity and pelvis which were opened and explored. There were no deaths in those cases in which the appendix had not perforated.

**Incisions**—It is of interest to compare the type of incision used in the two hospitals. Of the 281 cases at St. Mary's the McBurney's incision was used in 164 cases and the right rectus in 87 cases. 5 cases were not operated upon and in 31 recd's there was no report of the type of incision used. This is in contrast to the reports at New York Hospital where the right rectus incision was used in 396 cases and the McBurney in 162. The remaining cases were either not operated upon or not reported. The McBurney incision was used much more frequently before 1920 and seldom in the more recent year. It is generally felt that the right rectus incision is much to be preferred as it is a better exposure and allows a more complete exploration of the abdominal cavity.

**Drains**—Of the 281 cases at St. Mary's drains were used in 142 or 49 per cent of the cases. Of the 186 unperforated cases drains were used in 41 cases or 21 per cent. The types of drains used were as follows:

Rbb d m	5
C g tt	8
Rbb t b	3
M k l	
C tt i bb d	1
C g tt i bb t b	1
fyp t p f d	1

There were 64 cases in which some free fluid was found although an actual spreading peritonitis may not have been present. All of these cases were drained as follows:

Rbb d m	28
C tt	23
Rbbe t b	5
M k l	3
C g d M k l	1
Type t p f d	4

toxaemia from preleucopenia. One died the first day post operative from lobar pneumonia and empyema and the culture from the chest fluid showed staphylococcus. Of the 16 cases with peritonitis 7 developed pneumonia 1 with lung abscess. One case showed myocardial failure with rapid weak pulse cyanosis and dyspnea.

As stated above the series of cases at New York Hospital was divided into 145 chronic and 45 acute cases. There were no deaths among the chronic cases and 22 deaths among the acute cases. That gave a mortality rate of 48 per cent among the acute cases or 36 per cent for the whole series of acute and chronic cases taken together. The 22 cases were evenly divided between male and female—11 of each. There were 3 deaths from the 23 cases of five years and under a rate of 13 per cent and 19 deaths from the 59 cases of six years and over a rate of 32 per cent. The most usual length of time from onset of symptoms to operation was two days the longest time was two weeks and the patient was brought to the hospital in a moribund condition the second longest interval was six days the shortest interval was one day. The symptoms were all marked as might be expected in proportion to the severity of the attack. Fifteen of the 22 cases had history of vomiting 7 did not vomit and in 7 histories the symptom was not stated. All had rigidity and tenderness in the right lower quadrant. It was stated that had been given cathartics. The temperature pulse and blood counts were high in most cases the highest temperature was 104.4 F the lowest 98.4 F the monobuclear case and the average as 10. The highest pulse rate was 116 the lowest 96 and the average 107 the highest blood count was 26,000 polymorphonuclears 9 per cent the lowest 43,000 polymorphonuclears 50 per cent and the average 16,800 polymorphonuclears. The immediate cause of death in all except one case was toxemia from acute general peritonitis in all cases. The one exception was a girl with mild pleural effusion of the liver. Besides the peritonitis there was an additional complication of pleuritis in this girl. In 11 cases out of the one case with a blood culture from the blood.

coccy? case of abscesses of the abdominal wall and 5 cases of multiple abscesses of the abdominal cavity and pelvis which were opened and explored. There were no deaths in these cases in which the appendix had not perforated.

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	C
Pbb d m	5
C tr	8
Rbb t b	3
M k l	2
Cg ett d bb d m	1
Cg tt d bb t b	1
Typ t p f d	1

There were 64 cases in which some free fluid was found although an actual pyelonephritis may not have been present. All of these cases were drained as follows:

	Cases
Rbb d m	28
Cg tt	23
Rbb t t	5
M k l	3
Cg d M k l	1
T p e r f d	4



There were 56 cases of appendiceal abscess all of which were drained as follows:

Cigarette	Cases
Rubber dam	16
Rubber tube	
Mikulicz	1
Cigarette and Mikulicz	1
Tube and perforated	6

Rubber dam and cigarettes were much the favorite types of drains—rubber dam were used in 60 cases of the 147 drained or 41 per cent and cigarettes in 41 cases or 28 per cent—a total of 75 per cent of all the cases drained.

At New York Hospital drainage was used in 738 cases 57 per cent of the acute cases or 39 per cent of the total series of 607 cases. Of these 83 were used in unperforated cases or 7 per cent of the 307 unperforated cases. The predominant type of drain used from that used at St. Mary's Hospital. The numbers and details were as follows:

Mikulicz	Cases
Rubber dam	104
Rubber tube	40
Rubber tube and Mikulicz	1
Rubber tube	11
Rubber tube and cigarette	
Rubber dam and Mikulicz	5
Cigarette and Mikulicz	3
Cigarette and rubber dam	1
Rubber tube and rubber dam	1

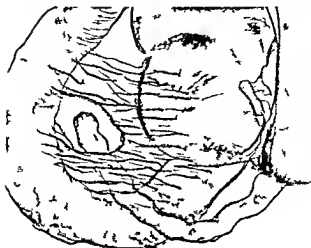
In the unperforated case the cigarette and rubber dam drain were most popular whereas in case of abscess and peritonitis the Mikulicz was used most frequently. The style of drains as well as that of incisions appears to have changed with the years. After 1910 the Mikulicz was used not only as the rubber dams and cigarettes became less popular.

**Chronic Cases.**—It has been interesting to find the cases into acute and chronic although obviously the division line cannot be clearly cut. Those patients who had had frequent previous attacks and who had had rather mild symptoms rarely

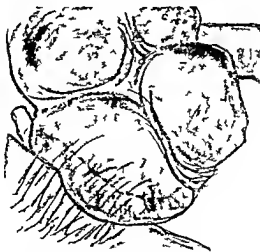
period with occasional acute exacerbations were classified on the records as chronic cases. At St. Mary's Hospital there were 47 which were classed as chronic case or 16 per cent of the total series of 287. Naturally their symptoms tended to be milder than in the acute cases. Twenty six or 55 per cent gave a history of vomiting. All had had repeated attacks of pain in the right lower quadrant with or without nausea. The time from onset of present symptom to operation ran from one day the shortest to six months the longest. Most of the cases gave a history of symptom for two weeks to two months. The pulse varied from 76 the lowest to 164 the highest with 105 as the average. The temperature varied from 97.4 F the lowest to 104.6 F the highest with 99.5 F as the average. The blood count varied from 4300 the lowest to 22,000 the highest with an average of 11,800. The polynuclear count was usually normal from 50 to 85 per cent. In the 47 cases there was one death in a patient who had had attacks of pain in the right lower quadrant for six months with increasing frequency accompanied by vomiting. There were 5 apparently normal appendices operated upon or 10.6 per cent of the 47 cases. The operative reports in these cases were as follows:

- 1 Large mesenteric lymph nodes—lymphadenitis appendix apparently normal
- 2 Appendix not inflamed—possible pathologic gall bladder
- 3 No abnormalities seen
- 4 Appendix normal—calcific and calcareous lymph node possible tuberculous peritonitis
- 5 Oxyuriasis vermicularis in appendix

In the series from New York Hospital there were 145 chronic cases or 24 per cent of the total 607 cases. The age variation is shown by the table on p. 1217. There were 49 males and 96 females. Eighty one cases or 56 per cent gave a history of previous attacks. The symptoms were comparatively mild and usually had extended over a considerable period. All except one had pain which usually began in the epigastrium or around the umbilicus or as generalized abdominal pain and localized in the right lower quadrant. Fifty six of the 145 cases

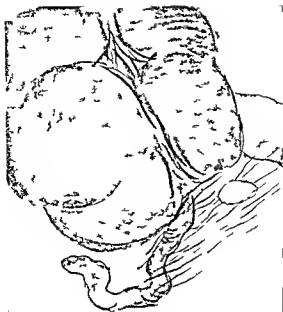


F 411



F g 41

F g 411-414—F II f pe f h 1 pe d f l  
 h ldre less h m h h sec ce f S M F Hosp l  
 f Chld N Y k



F g 413



F g 414

38 per cent had vomiting 69 cases 48 per cent had neither nausea nor vomiting 72 cases 15 per cent had constipation 7 cases had diarrhea One hundred and twenty four cases 77 per cent had tenderness in the right lower quadrant usually elicited only on deep pressure 34 cases 23 per cent had slight rigidity of the right rectum There were no cases which showed marked rigidity In 20 cases 13 per cent the abdominal examination was entirely negative The time from onset of symptom to operation varied greatly the shortest was one day the longest ten years there were 23 cases who had had symptoms for one year or over 36 cases for one month to one year 14 cases for under one month and in the remaining cases the time was not stated The pulse varied from 60 the lowest to 144 the highest with 93 as the average the blood count varied from 4600 polymorphonuclears 38 per cent the lowest to 57000 polymorphonuclears 84 per cent with 11000 polymorphonuclear 11 per cent as the average The type of incision were right rectus in 88 cases McBurney in 37 cases and the rest not stated There were no drains used Twenty three cases not operated upon of these 6 returned later for operation 3 with chronic and 3 with acute appendicitis 6 left the hospital against advice before operation 1 had tonsillitis but no appendicitis 1 had cholecystitis 1 developed to illitis and 1 bronchitis and were advised to return later for operation but did not do so The remaining cases were not operated upon because of the mildness of the symptom Seven patients 4.1 per cent were operated upon in which apparently no inflammation was found

- 1 Large node of the mesentery but the appendix looked normal
- 2 Appendix appeared normal
- 3 Appendix not inflamed but there was worm theecal calculus
- 4 Corpus luteum cyst present but appeared normal
- 5 Mucosa and tissue edematous appeared apparently normal
- 6 7 Microscopic report normal in all but the found black at operation

There were several other cases in which the microscopic report was a normal appendix but in which bands adhesions links or concretion were found at operation sufficient to account for the symptoms. The pathologic reports stated that the appendices were either linked or constricted somewhat inflamed or congested contained concretions or fecaliths had bulbous tips were bound down by adhesions or bands were swollen elongated or enlarged or were retrocecal or hung over the pelvic brim. In other words in all cases except the 7 mentioned above there was found sufficient abnormality either around or within the appendix to account for the symptoms. Thirty four of the 145 cases or 23 per cent were attended by complications of which the following is a list:

- 1 Cystoma of the ovary (one ruptured) 8 cases
- 2 Hematoma of wound 3 cases
- 3 Adhesions of peritoneum 3 cases
- 4 Hypertrophy of the tonsils 2 cases
- 5 Mumps 1 case
- 6 Lobar pneumonia and hematoma of wound 1 case
- 7 Bronchopneumonia on fourth postoperative day with signs of tuberculosis transferred to Bellevue
- 8 Acute rhinitis 1 case
- 9 Acute pharyngitis 1 case
- 10 Acute tonsillitis 1 case
- 11 Acute bronchitis 1 case
- 12 Abscess of wound 1 case
- 13 Dilatation of sigmoid and cecum 1 case
- 14 Round worm in tip of appendix 1 case
- 15 *Ascaris lumbricoides* in cecal valve 1 case
- 16 Ring worm 1 case
- 17 Cellulitis of wound and appendiceal abscess 1 case
- 18 Adhesions of wall bladder and undescended cecum 1 case
- 19 Acute lymphadenitis of mesentery 1 case
- 20 Chronic endocarditis 1 case
- 21 Chronic myositis and abscess of flank 1 case
- 22 Chronic constipation 1 case

Six cases were reported as having no definite sequelae 3 cases of acute appendicitis 2 cases of adhesion of the peritoneum



tonitis caused death it was stated that no gross perforation was observed. Five cases were not operated upon.

At New York Hospital there 302 or 66.7 per cent of the 457 acute cases which had not perforated. *There were no deaths from this group.* Eighty-three cases or 27 per cent were drained. Only one case was operated upon which showed a definitely normal appendix. Five cases were not operated upon as the symptoms subsided. The time from onset of symptoms to operation varied from six hours the shortest to six months the longest while the usual time was two to four days. The symptoms were intermediate in severity between those shown by the chronic cases and the perforated cases. The usual course was pain beginning about the umbilicus and later settling in the right lower quadrant accompanied by anorexia, nausea and vomiting. Constipation occurred much more frequently than diarrhea. Two hundred and forty-five cases or 81 per cent of the 507 gave a history of vomiting. In this group the lowest pulse rate was 52 the highest 157 and the average 107 the lowest temperature was 98 F the highest 106 F and the average 101.1 F the lowest blood count was 4000 polynuclears 69 per cent the highest 46600 polynuclears 96 per cent and the average 14500 polynuclears 8 per cent.

**Abscesses**—At St. Mary's Hospital there were 36 cases or 17 per cent of the total 281 cases which were found at operation to have formed abscess. Of these 10 cases were in the cecum or under 15.8 per cent of the cases of that age limit. As was to be expected the symptoms in these cases were usually more severe than in the unperforated cases. The time from onset of symptoms to operation varied from twelve hours the shortest to three weeks the longest with the average interval. The temperature and pulse of all the perforated cases abscess and suppurative peritonitis were averaged together. The lowest blood count in this group was 14000 the highest 44000 and the average 25700 with the polynuclears varying between 80 and 90 per cent. The few deaths 8.3 per cent of the 36 cases. The cause of death were (1) Appendiceal abscess followed by toxemia (2) postoperative peritonitis relieved by fecal fistula pneumonia and empyema and (3) toxic myocarditis.



and 1 case of chronic constipation. In the whole series of 145 cases there were no deaths.

**Division of Cases**—As in Dr. Beckman's analysis of cases from Bellevue Hospital the acute cases in the two series have been divided as nearly as possible into three groups. Those which had not perforated, those which had perforated and in which there was free fluid either at the site of perforation or a spreading peritonitis, and those cases which had perforated and in which the fluid had been allowed to form an abscess. It must be borne in mind, however, that this grouping cannot be clear cut since in some cases it was either difficult to decide or was not stated whether perforation had taken place rather than free fluid with no apparent perforation, etc. However, this grouping has been followed as nearly as could be ascertained from the record.

**Unperforated Cases**—At St. Mary's there were 186 cases or 64 per cent. of the total 287 in which no perforation had taken place. These include both acute and chronic cases as they were grouped together in the record. There were 41 chronic cases and the other 139 or 48 per cent. of the acute cases unperforated. In the acute cases the time from onset of the symptom to operation varied from six hours to the shortest to ten days the longest. Forty-four cases were operated upon by the end of the first twenty-four hours, fifteen on the first day, and by the end of the second day, and 71 cases by the end of the third day. There were 97 or 49 per cent. of the 186 unperforated cases were operated upon by the end of the third day from onset of symptom. The 41 chronic cases had had symptom intermittently over periods lasting from months to years. Forty-two per cent. of the 186 acute unperforated cases were operated upon. The lowest pulse rate was 64 the average pulse rate was 97, the highest 136 and the range 117, the lowest temperature was 97.4 the highest 104.6 and the average 100.4, the lowest blood count was 7100 the highest 9000 and the average 15000. There were 4 deaths, 2 from perforation, 1 from peritonitis and 1 from lung abscess. (1) Lobar pneumonia, (2) peritonitis and lung abscess, (3) intestinal perforation, (4) perforation and peritonitis. In the cases which were

perforation caused death it was stated that no gross perforation was observed. Five cases were not operated upon.

At New York Hospital there 30% or 66% per cent of the 45 acute cases which had not perforated. *There were no deaths from this group.* Eighty three cases or 21 per cent were drained. Only one case was operated upon which showed a definitely normal appendix. Five cases were not operated upon as the symptoms subsided. The time from onset of symptoms to operation varied from 12 hours the shortest to 18 months the longest while the usual time was two to four days. The symptoms were intermediate in severity between those shown by the chronic cases and the perforated cases. The usual course was pain beginning about the umbilicus and later settling in the right lower quadrant accompanied by increasing nausea and vomiting. Constipation occurred much more frequently than diarrhea. Two hundred and forty five cases or 81 per cent of the 30% gave a history of vomiting. In this group the lowest pulse rate was 52 the highest 122 and the average 100 the lowest temperature was 98 F the highest 106 F and the average 101.1 F the lowest blood count was 4000 polynuclears 6% per cent the highest 46 600 polynuclears 36 per cent and the average 14 500 polynuclears 83 per cent.

**Abscesses**—At St. Mary's Hospital there were 36 cases or 17% per cent of the total 281 cases which were found at operation to have formed abscesses. Of these 10 cases were in the year or under 15.8 per cent of the cases of that age limit. As was to be expected the symptoms in these cases were usually more severe than in the unperforated cases. The time from onset of symptom to operation varied from twelve hours the shortest to three weeks the longest with two days as the average interval. The temperature and pulse of all the perforated cases abscesses and suppurative peritonitis were averaged together. The lowest blood count in this group was 14 000 the highest 44 000 and the average 25 000 with the polynuclear varying between 30 and 90 per cent. There were 3 deaths 8.3 per cent of the 36 cases. The causes of death were (1) Appendiceal abscess followed by toxemia (2) postoperative distention relieved by fecal fistula pneumonia and empyema and (3) toxic myo ar

diti. Complication which did not end in death were as follows: 2 cases of bronchopneumonia, 1 case of subdiaphragmatic abscess and fecal fistula, 1 acute tonsillitis, 1 local purulent peritonitis, 1 megacolon and undescended colon, 2 pelvic abscesses, 1 case with infiltration of both apices of the lung, and 1 case was followed by a ventral hernia.

At New York Hospital there were 81 cases of abscess, 16 per cent of the 497 acute cases. There were 7 cases five years and under, 3 at three years. The usual age was thirteen to fifteen years inclusive—36 cases. The time from onset of symptoms to operation varied from twenty-six hours the shortest to two months the longest. The largest number of cases was operated upon after two days of symptoms. The lowest pulse-rate was 80, the highest 152, and the average 113; the lowest temperature was 99.4° F., the highest 104° F., and the average 101.8° F.; the lowest blood-count was 9500 polynuclears 38 per cent, the highest was 43700 polynuclears 96 per cent, and the average 19900 polynuclears 84 per cent. There were 2 deaths, 2.4 per cent. The complications other than those which ended in death were as follows:

- 1 Acute local peritonitis 6 cases
- 2 Acute general peritonitis 3 cases
- 3 Fecal fistula 3 cases
- 4 Small pelvic abscess 2 cases
- 5 Wound reopened for more drainage 2 cases
- 6 Infection of wound 1 case
- Pyopneumothorax 1 case
- 8 Carcinoid of appendix 1 case
- 9 Bronchopneumonia 1 case
- 10 Cellulitis and abscess of abdominal wall 1
- 11 Diphtheria 1 case
- 12 Acute bronchitis 1 case
- 13 Otitis media 1 case

Pleuritis.—At St. Mary's Hospital there were 47 cases of spread pleuritis, 18 per cent of the acute cases. Of these 17 were five years and under, 21 per cent of the 63 cases of that age. The average time from onset of symptom to operation was two days, the shortest two hours and the longest

ix month The average pulse of the perforated cases taken to ether was 175 the lowest 87 and the highest 168 the average temperature was 101.7 F the lowest 98 F and the highest 106.6 F The average blood count of the spreading peritonitis case was 27,400 the lowest 6000 and the highest 38,000 with the polynuclears 85 to 90 per cent Eleven cases died from toxemia 26.2 per cent of the 42 cases

At New York Hospital there were 14 cases of peritonitis 16 per cent of the 45 acute cases The usual time from onset of symptoms to operation was two days the shortest eight hours and the longest fourteen days The youngest case was four years of age there were 1 case of five years and under but the most common age was twelve to fifteen years The symptoms were the most severe of the three groups with nausea vomiting and severe pain in the abdomen especially in the right lower quadrant The average pulse was 119 the lowest 84 and the highest 160 the average temperature was 102.1 F the lowest 98.4 F and the highest 105 F the average blood count was 20,100 polynuclear 86 per cent the lowest 4300 polynuclears 50 per cent and the highest 43,000 polynuclears 97 per cent There were 20 deaths 71 per cent of the cases The causes of death were toxemia from spreading peritonitis and paralytic ileus 1 case of pyelitis and abscess of the liver 1 case gave a positive blood culture of hemolytic streptococcus The complications were as follows

- 1 Wound broke down 4 cases
- 2 Sinus formed 4 cases
- 3 Pelvic abscess 2 cases
- 4 Blood culture of hemolytic streptococcus 1 case
- 5 Pneumococcus infection 1 case
- 6 Pelvic peritonitis 1 case
- 7 Pyelitis 1 case
- 8 Glycosuria 1 case
- 9 Residual abscess 1 case
- 10 Fecal fistula 1 case

Complications The total list of complications at St. Mary's Hospital including those already given for perforated cases is as follows

- 1 Wound infection 11 case
- 2 Pneumonia 3 case of broncho pneumonia one with pleura 1 lobar pneumonia 1 lobar pneumonia with empyema 1 lobar pneumonia with subdiaphragmatic abscess and 1 case of tuberculosis of the apices

*Elizabeth Webb* Age 6 years Admitted 2 25 1930 Discharged

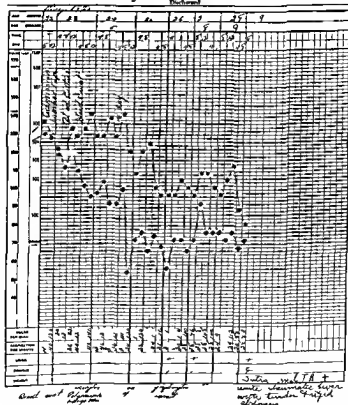


Fig 415—Chart of cutaneous lesions in patient with pneumonia. The chart shows the course of the disease, with the patient being treated with salicylates.

- 3 To list or list with the main cases
- 4 Bronchitis 3 cases



- 11 Typhoid fever 1 case
- 12 Varicella 1 case
- 13 Acute rheumatic fever 1 case
- 14 Umbilical hernia 1 case
- 15 Femoral hernia 1 case
- 16 Diphtheria 1 case
- 17 Adhesion 2 cases
- 18 Acute infective cholangitis 1 case
- 19 Secondary hemorrhage 1 case
- 20 Phimosis 1 case
- 21 Hydrocele 1 case
- 22 Fracture of radius and ulna 1 case
- 23 Intussusception of appendix 1
- 24 Mesenteric and undescended cecum accompanied by abscess of appendix 1 case

Below the complications in case reported in the abstract already cited the following are the complications at New York Hospital

- 1 Local infection of wound 26 cases
- 2 Pelvic abscess 9 cases
- 3 Cystoma of right ovary 3 cases
- 4 Fecal fistula 5 cases
- 5 Bronchopneumonia 4 cases
- 6 Lebarpeur pneumonia 4 cases
- 7 Acute bronchitis 4 cases
- 8 Acute otitis media 3 cases
- 9 Abscess of abdominal wall 3
- 10 Pyelitis 2 cases
- 11 Tonillitis 2 cases
- 12 Abscess of peritoneum 2 cases
- 13 Acute salpingitis 2 cases
- 14 Abscess of parotid 1 case
- 15 Pneumococcal infection of peritoneum 1 case
- 16 Abscess in flank 1 case
- 17 Pylephlebitis and abscesses of liver 1 case
- 18 Blood culture of hemolytic streptococcus 1
- 19 Extraperitoneal abscess appendix not removed 1 case
- 20 Tuberculous mesenteric lymph node 1 case

- 21 Gonorrheal infection of vagina 1 case
- 22 Diphtheria 1 case
- 23 Glycosuria 1 case
- 24 Cystitis 1 case
- 25 Meckel's diverticulum 1 case
- 26 Subphrenic abscess and pneumothorax 1 case
- 27 Carcinoid of appendix 1 case

Sequelæ—At New York Hospital there were 20 cases 43 per cent of the whole followed in the Outpatient Department in whom definite sequelæ were found to have occurred. There were 13 cases of ventral hernia 28 per cent which returned to the hospital for further operation. Besides these there were 3 cases of sinus of the abdominal wall 2 cases of post-operative adhesions of the peritoneum and 2 cases of cellulitis of the operative wound. At St Mary's Hospital the incidence of sequelæ was about the same.

**Summary and Conclusions**—1 Two series of cases of appendicitis in children taken from the record of St Mary's Free Hospital for Children and New York Hospital have been analyzed as to age, sex, number of deaths, etc.

2 At St Mary's Hospital it was found that the number was evenly divided between boys and girls. At New York Hospital the number of cases in boys was slightly higher.

3 The disease is much less common under five years of age probably due partly to the difficulty in diagnosis. The number of cases increased with the increasing age of the patient, the largest number occurring between nine and fifteen years.

4 The number of deaths in both series was evenly divided between boys and girls. The death rate was much higher in the case under five years and decreased as the age of the patient increased. The rate was highest in the perforated cases and lowest in the chronic cases as was to be expected. The most common cause of death was toxemia from spreading peritonitis. The most important factors which affect the death rate in acute appendicitis are (1) The severity of the attack itself since many are a history of frequent previous attacks from which they have recovered without surgical interference (2) other



things being equal the earlier the diagnosis in acute cases the lower is the death rate (3) the administration of a cathartic may hasten the perforation of an otherwise only moderately inflamed appendix. Cathartics are so frequently given to children with abdominal symptoms that their importance must be emphasized.

5 The most common type of incision at St. Mary's was the McBurney and at New York Hospital the right rectus. The latter is now generally used and found to be more satisfactory. The most usual types of drains at St. Mary's are the rubber dam and cigarette and at New York Hospital the Mikulicz.

6 The so-called chronic cases which gave a history of repeated attacks formed about one eighth of the total series at St. Mary's and one quarter at New York Hospital. The symptoms were usually milder than in the acute cases and had extended over a longer period of time.

The acute cases were divided into those which had not perforated, those which had perforated and formed abscesses at the site of perforation and those which had perforated and had free fluid in the abdominal cavity. It was found that the symptom signs pulse temperature and white count increased in the order given above, the average blood-count always above normal but the average temperature was just above  $102^{\circ} \text{F}$ .

A	S	J	C	S	N	H
Age	Sex	Temp	White	Count	Temp	White
1	5					4
	2	0			0	
3	12	5		1	5.9	
4	8	14		2	7.6	
5	5	9		14	4.8	
6	12	14		6	0	
7	14	11			8	
8	9	1			8	
9	19	14		13	11	
10	13	15		8		
11	1	1		18	13	
12	1	10				
13	4			1	4.1	
14	5				4	
15	1	2		3	1.0	
16	0	1		1	0.14	
Total	143	144		8		





I	P	l	F	S	I	f d m j				Ded mos				A po			
						f d p	f d p	N f	m j	h d	h d	h d	h d	h d	h d	h d	h d
1	mos	d d d	F	6	P	A	cr	d d m l	filled	Ded 4 d	p	d pa	f m	le			
1		Abd R l	F	6	N	2	A	sc d d	hd	D d 4 d	oc	pe	f m p	m			
1		l b h f	F	6	N	D d 3 h	f d m			b bl	ized	pe	o				
(C enc)		d m	6 F	T	P	N				D d bed	pe	b bly	l m				
1		l	F			N	f d	h d	d f	D d 1 d	Y	f m	ad				
1		l d b	0 0 F	10		N	1 d	f d		D d 2 d	ca d	h d	oc				
1		d m	1 F	0	P	P	rd	f d m	d fl	D d 2 d	ca d	h d	oc				
1		l b d	04 F		P	N	f d	d d	h d	D d d	rel	d	P	d			
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1		l	0 6 F	42	P	A	m	b f	d d	A	f	bd	ad	h	l		







## CLINIC OF DR. I. W. HEID

BETH ISRAEL HOSPITAL

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### ROENTGEN DIAGNOSIS OF GALL BLADDER DISEASE

In 1901 Carl Beck of New York was the first to succeed in visualizing gall stones roentgenologically. Since then efforts have been untiring to improve the method of x ray diagnosis of the gall bladder. It is to the credit of the American roentgenologists notably among whom are Leonard and George Carman and his co worker Miller Pfahler Case Caldwell L. G. Cole and others who have made most important contributions in this field of work. The work of Knox in England and Thurston in Holland likewise deserves special mention. Haenisch of Germany also made valuable contributions in this field.

In the study of the gall bladder by means of the Roentgen ray a number of methods are at present in vogue and because each has its peculiar usefulness a discussion of all methods seems to us worthy of consideration.

In view of the fact that the recent epoch making discovery by Graham Cole and Copher making it possible to visualize the gall bladder by means of halogen dye has yielded such excellent results this method will be discussed first. It must be emphasized however that the roentgenologic method alone—no matter how perfect—will lead often to mistaken diagnoses. If we were to rely mainly on radiographic evidence in any abdominal disease diagnosis would register a marked step backward. Stated aptly by C. H. Mayo many years ago:

The importance of the cholecystographic method is indicated by the fact that almost immediately after the first publication by Graham Cole and Copher in February 1924 it gained world wide recognition. The accomplishment of Graham and his co workers is the outcome of an important discovery



by Abel and Rowntree who when investigating the pharmacologic properties of certain substances discovered that phenol tetrachlorophthalein was excreted in the bile after intravenous injection. They suggested the use of this dye as an indicator of liver function. Rowntree, Hurwit, and Bloomfield immediately embraced the use of this dye in the study of hepatic function and Rosenthal introduced a method by which it was possible to prove the practical value of this substance as a liver function test.

Graham and Cole first used the chlorine and calcium compound of phenolphthalein for cholecystography but it proved toxic. The bromine compound was tried next and found more suitable. This is the sodium salt of tetrabromophenolphthalein in which four atoms of hydrogen are replaced by four atoms of bromine. In February, 1925, Graham, Cole, and Coppey announced the success obtained by sodium tetrabromophenolphthalein in visualizing the gall bladder. Their work was not only an impetus to diagnostic study but proved that it was possible to study the physiologic function of the gall bladder by this method, eliminating most of the ethical and physiologic drawbacks with existing contrast media and the physiologic effects of the gall bladder and ducts which otherwise would have been impossible. This cholecystography is not only an important diagnostic method but is even more important as a means of studying the function of the gall bladder and the large ducts.

Before discussing the physiologic and diagnostic importance of cholecystography let us first completely acquaint you with the method of employing the dye.

**Methods of Employment of the Dye.**—The intravenous injection of sodium tetrabromophenolphthalein is originally advised by Graham, Cole, and Coppey. Whitaker and Milken soon afterwards pointed out that the dye is not more toxic than bromine and that because of this the maximum weight may be given in one half the dose which is 0.4 gm. per kg. body weight—and in this figure the traditional 10 per cent given in 10 per cent solution is which 2 cc. of 10 per cent sodium carbonate is added. In this solution the cause is shown

as opaque as that of bromin. This was soon confirmed by Graham Cole and Copher. Since then the sodium tetraiodophenolphthalein compound is almost universally used. Carman as well as Herrman advised the bromin preparation by mouth and the iodine preparation intravenously. At present however sodium tetraiodophenolphthalein as advocated by Whitaker and Milliken is used almost exclusively.

Regarding the toxicity of phenolphthalein the work of Ottenberg and Abraham is of great interest. These authors found that doses of phenoltetribromphthalein 0.1 per kg. body weight in experimental animals cause no symptoms. 0.2 cause weakness. 0.3 to 0.4 cause severe weakness and 0.4 to 0.5 bring on convulsions with respiratory failure with evidence of congestion and even necrosis of the liver.

The studies of Bick and Wallace of the toxic effect of dyes convinced them that the use of the dye in certain circumstances is not free from risk. Normal bile containing the dye introduced experimentally into the pancreatic ducts is sufficient to produce pancreatitis. They concluded therefore that in cases of cholecystitis in which stones are present in the common bile duct and the conditions are otherwise favorable for the retrojection of bile into the pancreas the danger of acute pancreatitis will be much greater if the regurgitation contains the dye. It is a good precaution from a clinical standpoint not to use the dye in cases of jaundice of the obstructive type.

The technique of the intravenous method—according to Graham and Cole—is as follows: 3.5 to 5 gm. of the salt are dissolved in 35 to 40 c.c. of sterile distilled water. The solution is filtered and sterilized again in a boiling water bath for fifteen minutes. If the salt is kept in the dark it is stable for thirty-six hours. The injection must be given very slowly consuming at least six minutes.

At 8:30 A. M. 20 c.c. are injected and at 9 A. M. another 20 c.c. the patient lying on the right side. Then 2.5 gm. of bicarbonate of soda are given every three hours while the patient is awake to aid gastric and duodenal rest. Bicarbonate of soda prevents the emptying of the gall bladder and aids in the

concentration of the dye. No lunch is permitted. The evening meal eaten early consists mainly of carbohydrates.

The films are taken four, six, eight, twelve, twenty-four and thirty-six hours after the injection. Carman and Counsellor however advise that films be taken only five, eight and twenty-four hours after the injection.

The shadow of the gall bladder begins to appear three hours later, reaching its maximum in six to twelve hours. Occasionally unpleasant sensations such as dizziness, nausea, body pains and a fall in blood pressure are produced after the injection but these effects are transient. The fall in blood pressure may be relieved by the intramuscular injection of 0.5 to 1 cc of 1:1000 adrenalin solution. A local skin reaction should be avoided by preventing any of the substance from escaping under the skin because if it does it causes marked induration and sometimes necrosis. If there is escape under the skin hot fomentations will give relief. Palefsky devised a special syringe to perfect this intravenous method of the dye. According to him the method is so simple that it may easily be used in the office and outpatient departments. He claims also that there are no untoward effects and if this is correct certainly it would prove of great advantage.

Whitaker, Milliken and Vogt were the first to advise the oral administration of the haloen compound stating that if the capsules are so hardened as to pass from the stomach undissolved gastric irritation is prevented. They advocate hardening the capsules by coating them with salol, kaolin, gluten or some substance insoluble in stomach fluid but soluble in the intestines. The dye is absorbed from the intestine and passes through the liver into the gall bladder creating a shadow equivalent to that obtained by the intravenous method. This procedure is correct to a large extent and is therefore a widely accepted method that may be employed in ambulatory cases, in hospital outpatients and in private practice.

Stewart advocates the use of ampoules of methyl iodide (Mallinckrodt). One ampoule of this substance is placed in

each No. 3 gelatin capsule for the average patient weighing 150 pounds. If the patient weighs more, more capsules are made up from another ampule for each additional 25 pounds of weight. The drug is contained in sealed colored ampules and its freshness may be relied upon. The ampules are opened only when the patient arrives in the office. After they are filled they are dipped in a solution of keratin and placed on a screen to dry, requiring about ten minutes. The formula for the keratin is as follows: Keratin, 1 part; dissolved in equal parts of dilute alcohol and 10 per cent. of ammonia water sufficient to make 10 parts.

It is well known, however, that even if the dye be given in capsules which dissolve in the stomach, there are no more unpleasant effects than if given in the hardened form. In fact it is of greater advantage to give capsules which dissolve in the stomach, because in this way we have a greater percentage of gall bladder shadows. It is well known that gelatin capsules frequently remain undissolved in the colon. For a long time we have given the powdered form with apple sauce. This proved very efficacious because we found that the capsules which are supposed to dissolve in the stomach frequently pass the stomach undissolved.

The most efficacious method for the oral administration of the dye was worked out by Levyn and Aaron. Their method is based on the theory that the free acid of tetraiodophthalein in a finely divided state is transformed by the duodenal contents into a soluble salt which is absorbable. Adding fruit juices to the dye precipitates the free acid and renders it available for absorption. Grape juice is used for that purpose. The tartaric acid in the grape juice is more than sufficient to change the dye sodium salt to free acid. There is a special solution made according to the method of Levyn and Aaron at present on the market. We are at present using dye dissolved in grape juice and very seldom have we encountered a patient who did not retain the dye.

Anderson pointed out that the vomiting which was originally thought to be due to the presence of the dye in the stomach is not correct. He argues correctly that if the vomiting were entirely due to the action of the drug on the stomach, the pres-

concentration of the dye. No lunch is permitted. The evening meal eaten early consists mainly of carbohydrates.

The films are taken four or eight twelve twenty four and thirty six hours after the injection. Carman and Counsell however advise that films be taken only five or eight and twenty four hours after the injection.

The shadow of the gall bladder begins to appear three hours later reaching its maximum in six to twelve hours. Occasionally unpleasant sensations such as dizziness nausea body pains and a fall in blood pressure are produced after the injection but these effects are transient. The fall in blood pressure may be relieved by the intramuscular injection of 0.5 to 1 cc of 1:1000 adrenalin solution. A local skin reaction should be avoided by preventing any of the substance from escaping under the skin because if it does it causes marked induration and sometime necrosis. If there is escape under the skin hot foment will give relief. Palefsky devised a special syringe to perfect the intravenous method of the dye. According to him the method is so simple that it may easily be used in the office and outpatient department. He claims also that there are no untoward effects and if this is correct certainly it would prove of great advantage.

Whitaker Milliken and Voigt were the first to advise the oral administration of the barium compound stating that if the capsules are so hard as to pass from the stomach undissolved gastric irritation is prevented. They advocate hardening the capsule by coating them with salol keratin gluten or some substance insoluble in stomach fluid but soluble in the intestines. The dye is absorbed from the intestines and passes through the liver into the gall bladder casting shadows as dense to that obtained by the intravenous method. This proved to be correct to all intents and to present oral administration widely accepted because it is a method that may be employed in ambulatory cases in the hospital outpatient department and in private practice.

Stewart advocates the use of ampules in medical education (Mallinckrodt). One ampule of the barium is placed in

William Snow made the interesting observation that if the gall bladder still faintly without the dye and the same shadow is observed sixteen or seventeen hours after the administration of the dye the diagnosis of hydrop of the gall bladder is justifiable. The veracity of this observation was confirmed by a number of operated cases.

An excellent laxative is Glauber's salt 1 tablespoonful taken early in the morning on the day of examination or licorice powder 1 tablespoonful the night before. The patient should lie on the right side for half an hour after the dye is taken. Plenty of water may be taken until the patient retires. To each glass of water a teaspoonful of bicarbonate of soda should be added. In order to prevent untoward effects we like Pribram have found that atropin in dose of  $\frac{1}{10}$  to  $\frac{1}{8}$  m. before retiring is very effectual. Baetznir advocates the employment of 1 mg. of atropin together with camphor and papaverin before the dye is given. About twelve to fourteen hours after the administration of the dye—about 9 A. M.—the first film is taken on an empty stomach.

If the gall bladder is not well visualized and if it is noted that the dye is distributed undissolved throughout the colon or should a mottled dense appearance of some portion of the liver be noticed indicating the presence of the dye the patient is given a teaspoonful of bicarbonate of soda in half a glass of water and one or two hours later films are again taken. Quite frequently the gall bladder previously only poorly visualized casts a distinct dense shadow. In some cases the reabsorption from the intestines into the liver may take much longer so that a dense shadow of the gall bladder is obtained about twenty to twenty-four hours after the oral administration of the dye. Indistinct visualization of the gall bladder should be considered only as a sign of gall bladder disease if it is certain the dye was absorbed from the intestine.

The patient should take a film in order to see if the capsule has dissolved and whether the dye is present in the colon. If they are freely prepared in the office as advocated by Stewart there is a greater percentage of positive results.

ence of dye in the vomitus would be expected. In one case where the radiograph of the vomitus a shadow equally as dense as that given by an equal bulk of tap water was seen thus showing absorption of the dye. The vomiting is therefore not due to local action on the gastric mucosa. The dose by mouth is usually 75 gm divided in capsule of 0.3 gm two of which are taken every fifteen minutes.

The day before the dye is administered the abdominal films are taken of the gall bladder region in order to determine whether the gall bladder or calculus can be seen without the dye. A film is also taken of the abdomen in order to determine the distribution and quantity of gas in the colon. If an excessive amount is present a tablespoonful of carbon dioxide is taken just before retiring. We can fully confirm the findings of Ziegler and Hirsch that charcoal causes absorption of the gases in the colon. The day on which the dye is taken the patient is allowed only a light diet and the last meal is taken between 5 and 6 P.M. consisting of carbohydrate and fat. Stewart rightly fully advises fat with the meal because of the well known fact that fat empties the gall bladder. The dye is usually administered about two hours after the last meal.

The meal according to Stewart consists of the following: Creamed chicken, baked potatoes, bread and butter and a glass of milk. We therefore limit entirely to this meal with the exception of chicken. While there is no disadvantage in allowing chicken we find it more advisable not to allow proteins before the administration of the dye. An enema of pints of water and 2 teaspoonful of salt is given before retiring and the following morning.

If the patient gives history of obstructive constipation or a high colonic irrigation is ordered. The laxative dye is given but it is best not to give any laxatives by mouth because they increase intestinal peristalsis making the absorption of the undissolved dye difficult before it has been absorbed in the liver. A laxative however may be given the day before the gall bladder films are taken with utility in order to cleanse the colon thoroughly.

our impression that the untoward effects of the dye are more dependent upon the nervous status of the individual than upon the dye. Hence we believe the employment of 1 to 10 mg. of atropin the night the capsules are taken is very useful because it tends to allay the irritation of the vagus. Collapse manifestations were not noticed in any case and there was no serious fall in blood pressure.

Dyas, Sheldon, and Dyke report a case where death followed the oral administration of the dye. At necropsy a tear of the liver capsule was found at the most dependent portion of the right lobe. The other abdominal organs were normal. There seems to have been a degeneration of the hepatic cell. The tear in the capsule probably occurred as a result of the increased pressure within the liver brought about by the hemorrhage from the sinuses.

Cole, Copher, and Graham advocate the employment of phenoltetraiodophthalein for purpose of cholecystography. The advantages are that a smaller dose is required and that simultaneously with the cholecystographic study of the gall bladder it is possible to measure the excretory function of the liver. The largest amount of retention of dye has been observed in patients having jaundice due to obstruction of the common duct with stone, catarrhal jaundice, advanced case of atrophic cirrhosis of the liver, or duodenal ulcer accompanied by an inflammatory process in the gall bladder. The average figures for the retention of the dye in the blood serum in these diseases are respectively 55, 90, 47, and 58 per cent, half an hour after the administration of the dye.

**Technic.**—The dye is dissolved in freshly distilled water in sufficient amount to produce a solution the concentration of which must not exceed 8 per cent. The solution is filtered and sterilized in a water bath for fifteen to twenty minutes. It is given in the morning and a specimen of blood is taken half an hour after its administration and one hour later another sample.

The cholecystographic examinations are made at four, eight, and twenty-four hours and normally about 12 per cent remains



Pribram Gruenber and Strau recommend emptying the gall bladder by the intramuscular injection of 2 c.c. of pituitrin so that the dye may reach the gall bladder sooner.

Einhorn and Stewart and later Stewart and Ryan advocated the administration of the dye into the jejunum through the duodenal tube. By this method they claim that only a slight reaction such as faintness, vomiting and diarrhea appeared in a number of cases and that the reaction lasted only a short time. They rightfully pointed out that the iodine compound intensifies the shadow of the liver and some of their cases added them to differentiate irregularities and nodulation along the lower border of the liver as well as enlargement of the liver. Stewart himself a great advocate of this method advises its employment only in hospital patients.

Stegeman has worked out a technic for the rectal administration of the dye. He gives castor oil in the morning. At 5 P.M. of that day an enema and an intraluteal injection of pituitrin are given. At 8 P.M. 1 mg. atropine is given intramuscularly. After this the dye is given by enema in a proportion of 0.12 to each kilo ram body weight in solution 1:30. In this country Weiss independently advocated the rectal method. Boardman and McKenzie tried this rectal method found it to be of no advantage abandoning it and the opinion shared by all authors.

The untoward effects of the oral administration of the drug were classified by Graham Cole and Corbin who divided the reaction into three degrees.

1. The patient complains of slight headache, vertigo, lasts for a few seconds to a few minutes.
2. The same symptoms lasting several hours.
3. Nausea, vomiting, backache, slight tachycardia and a temporary fall in blood pressure.

When we employed the oral administration in about 400 cases the unpleasant effects are not very marked. At most there is some nausea, rarely vomiting. Only a few cases of the nausea and vomiting so excessive as to last for hours. This condition usually occurs in the middle of the day. It

With the Coolidge radiographic tube we use 4 inch gap 40 ma 3 sec for thin patients. For patient of about 150 pound we use 5 inch gap 40 ma and 4 sec for heavier patients we use the gas tube 5 inch gap 50 ma and 4 sec. Where the Bucky diaphragm is not used we use preferably the gas tube 4 inch 50 ma for thin to for very stout persons using small cone and diaphragm.



Fig 417—Mottled appearance of the gall bladder in a patient with gall stones.

At times it is necessary to rotate the patient slightly in order to throw the gall bladder out of the superimposed shadows produced by gas in the colon, rib shadow or spine. The best position in such case is to have the patient in the fourth oblique position that is the right posterior against the film and the left anterior side toward the tube centering the tube in the gall bladder region under the band and tilting it upward.

**Cholecystography as an Aid in the Study of the Physiology of the Gall bladder**—This is a conclusive and painstaking work on the physiology of the gall bladder by means of the dye as carried out by So man, Whitaker and Ellison.

in the blood at the end of half an hour 5 per cent at the end of one hour. The patient's serum is compared to standard and in a manner similar to that advised by Rosenthal when using phenoltetrachlorophthalein at least 12 to 14 cc of blood must be collected as the half hour sample furnishes enough serum to use as control.

Half of the serum obtained from the half hour sample of blood is placed in one half of the box. Beside it is placed a tube containing distilled water. In front of the tube of water placed the other half of the serum obtained from the half hour blood sample and a drop of 10 per cent sodium hydroxid is added to bring about the color. On account of the variation in the amount of serum which may be obtained for determination a reading should be made after the addition of the drop of 10 per cent sodium hydroxid and a little more alkali added to see whether the deepest color has been produced. If too much alkali is added the purple red color will turn brownish and may lead one to a reading higher than the correct one. In front of the tube of serum to which the alkali has not been added a placed tube of the standard until one is found that matches the color reflected through the tube of alkaline serum and the tube of water. The standards are made by adding 48 m of phenoltetrachlorophthalein to 100 cc of water. Various dilutions of this are made to 10 to 1 per cent. To all the water used in the dilution and preparation of solutions 2 cc of 10 per cent sodium hydroxid must be added to prevent fading. While not in use the standard must be kept in a dark place to prevent fading.

The technique has been explained in the work that follows.

The Bucky diaphragm is always used except in cases where the patient is unable to cooperate. The method of holding the breath has been explained in the book mentioned. It is important that the patient be able to hold his breath for the required time—this cannot be emphasized too fully. With a little practice on the part of the patient a satisfactory result can be obtained. The tube is centered over the gall bladder at a distance of 26 inches from the film. A malleable

make the sphincter incontinent. After the animal fully recovered the dye was introduced intravenously and only a weak shadow was seen three times and no shadow four times proving that an intact sphincter is necessary to obtain a normal cholecystogram. These authors likewise demonstrated the importance of the concentrating power of the mucous membrane of the gall bladder. They scraped off the gall bladder mucosa in a number of dogs and then introduced the dye intravenously. Under such conditions no gall bladder shadow was obtained.

An important observation was likewise made by the authors regarding the role the mechanical factors play in the emptying of the gall bladder. They found that increased intra abdominal pressure strenuous exercise of the abdominal muscles or forced respiratory movements had no effect on the size of the gall bladder shadow unless the duodenal tube was *in situ* and the individual experimented with exercised gagging action. These findings would tend to throw doubt upon the accuracy of those who state that the respiratory mechanism is the main factor in the emptying of the gall bladder and would indicate that the contractile power of the gall bladder plays the main role. Higgins demonstrated experimentally with absolute certainty that the gall bladder emptying depends upon the contractility of its musculature.

Silverman and Manville by cholecystography were able to prove the correctness of Meltzer's and Lyon's assertion regarding the emptying of the gall bladder by means of magnesium sulphate. After obtaining the shadow of the gall bladder they introduced 50 c.c. of a 25 per cent solution of magnesium sulphate through the duodenal tube. After the gall bladder bile was obtained a considerable reduction in the size of the gall bladder shadow resulted.

Renaud also found that magnesium sulphate introduced through the duodenal tube has a marked effect upon the emptying of the gall bladder. If pilocarpin is injected subcutaneously before the introduction of magnesium sulphate the action of the latter is diminished and the gall bladder does not empty. The findings of Renaud confirm the foregoing experimental

The experimental investigators experimented on healthy first-year medical students in Harvard University and were able to determine very important physiologic facts. They showed definitely that the gall bladder empties its content into the duodenum in response to the ingestion of food depending upon the chemical constituents of the food substance. Fat causes marked emptying of the gall bladder with considerable diminution in its size. Carbohydrates have no effect on the emptying. Peptone and lean meat cause normal emptying. Albumen of raw egg has no effect. Pure olive oil causes diminution in the size of the



Fig 418—Gall bladder re-expanded by gastric food



Fig 419—Gall bladder highly contracted

gall bladder in dogs but not in man. Sodium bicarbonate increases the density of the shadow. Physostigmin pilarpin pituitrin and adrenalin administered subcutaneously have a constant effect. Dilute hydrochloric acid by mouth though the duodenal tube nitrolic acid in meat, cinnamon starch and sugar also have a constant effect. Tauchel and Gien to do showed that the size of the gall bladder increased but the density diminished. Secretin has an effect in order to demonstrate the importance of the action of the sphincter of Oddi they swallowed a tube with a pill containing a red to

dye It is well known that normally the dye leaves the gall bladder in seventy two hours at most

Whitaker and Maddock and later Maddock and Whitaker proved the important role the common duct plays in the emptying of the gall bladder by means of cholecystography If the common duct is ligated the shadow of the gall bladder cannot be reduced Meneses as well as Whitaker had occasion to observe this physiologic fact in patients who were seized with biliary colic and common duct obstruction after the cholecystographic shadow had been produced The shadow of the gall bladder in the case remained twenty one days This evidence that a gall bladder containing tone can be reduced in size only if the duct is not occluded Maddock and Whitaker found that after the intravenous injection of the dye in normal animals small amounts were excreted in the urine and large amounts in the feces Animals with complete biliary obstruction on the other hand excreted considerable amounts of dye in the urine and also large amounts in the feces Furthermore the injury to the liver produced by sublethal doses of the dye although somewhat more severe in case of duct obstruction than in normal animals is readily repaired proving that even with obstruction there is no danger in administering the dye

Additional roentgenologic information regarding the physiology of the gall bladder worthy of mention is that given by Schondube who experimented on human beings who were tall with long gall bladder in whom the concentration of the dye in the gall bladder was very marked enabling him to study the motility of the organ affected He found that a marked muscular contraction takes place It begins first with the circular musculature later there is shortening in the longitudinal axis of the gall bladder In the latter period of emptying the neck dilates The gall bladder empties itself eventually up to a few cubic centimeters Peristaltic waves during the time of emptying could not be observed

Coppe and Illingworth found that the emptying mechanism of the gall bladder is dependent partly on an intrinsic muscular action and partly on its elasticity They noticed peristaltic

work of Doyen. Renaud likewise found that pituitary extract causes gall bladder contraction. On the basis of such findings he draws the therapeutic conclusion that magnesium sulphate introduced directly into the duodenum should be given in case of hypertonic gall bladder and pituitrin in the atonic gall bladder.

Saralequi observed a distinct effect of pituitrin upon the peristalsis of the gall bladder. The maximum effect was produced in twenty to thirty minute. A great deal of conclusive and important work regarding the action of pituitrin on the gall bladder was done by Schondube and Kalk in the Bermann's Clinic in Frankfurt. Their work led them to the conclusion that the injection of 2 cc. of pituitrin subcutaneously with the duodenal tube stimulates the gall bladder to expel its contents thereby demonstrating the contractile power of the gall bladder with absolute certainty. The bile begins to flow twenty minutes after the injection. That the bile comes from the gall bladder is proved by the fact that it contains 100 m. of bilirubin whereas the liver bile contains only 70 m. to 100 cc. In some cases of cholecystectomy bile contains 100 m. of bilirubin at times obtained several months after operation the biliary mulatin gall bladder bile Kalk and Schondube like their authors found that the action of pituitrin is not positive in all cases and it is not always possible to draw conclusions why it is effective in some and not in other.

The action of pepsin on the gall bladder—first demonstrated by Stepp—was confirmed by Cholecytography. It was found that 5 to 10 per cent solution of pepsin introduced through the duodenal tube caused considerable reduction in the size of the gall bladder shown fifteen to thirty minute.

Another important physiologic fact was proved by Copher namely that the bile is not absorbed in the small intestine as asserted by Sweet and B. Halpern but that it passes through the cystic duct. Copher ligated the cystic duct after the gall bladder was filled with the dye and found that after one week the dye did not disappear. I have myself killed three weeks after the experiment the gall bladder still contained the

dye It is well known that normally the dye leave the gall bladder in seventy two hours at most

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Coppe and Illingworth found that the emptying mechanism of the gall bladder is dependent partly on an intrinsic muscular action and partly on extrinsic Thymic peristaltic



contraction of the common duct in pigeons and it is suggested that the e contractions may take part in the flow of bile in some mammalia

Berg found that after complete lation of the common duct and transplantation of the proximal segment relatively normal cholecystograms were obtained. He reasons therefore that a specialized neuromuscular relationship between the gall bladder and the sphincter of Oddi can be excluded. Where this experiment may be perfectly correct we doubt whether the conclusion is justified because it is well known that an experimental cutting of a sphincter as well as the nerves supplying it is very quickly repaired. This is true of the sphincter of the cardia and of the esophagus as well as of the pylorus.

The contractility of the gall bladder was visualized in man during operation by Mitu and recently by Moser. Levine also brought forth recent endologic evidence of the contractility of the gall bladder. We have twice had occasion to see fluoroscopically a definite change of the gall bladder contour due to the contractility of the organ. The accompanying films of the same gall bladder taken a few minutes apart show the shape of the gall bladder. The indentation on the inner border of the gall bladder seen in Fig. 471 should be interpreted as a contraction because the are not distinctly visible in Fig. 470.

Ivy and Oldberg carried out interesting experiments. They filled the gall bladder of dogs with lipiodol. Twelve to twenty-four hours later secretin preparation was injected intravenously every ten minutes for one hour and roentgenograms were made two minutes after each injection. The injections emptied the gall bladder in the course of one hour; some dogs in the first hour and half and in others it had no effect.

Boeden made an analysis of the contractile curves of the human gall bladder constructed from cholecystograms taken at short intervals. After a meal of eggs, milk and cream he found that the average gall bladder discharges approximately three quarters of its volume in the first half hour after each meal. The sudden discharge of the first two minutes is interpreted as being due to the opening of the sphincter with interruption of

the emptying during the next two minutes to the initial increase of resistance offered by the sphincter to the flow of bile and the subsequent discharge to the contractile force of the gall bladder. Stimuli other than the ingestion of food may provide the initial response. The odor of fried bacon may cause a momentary discharge of bladder bile. The same initial response is elicited when a fasting patient swallows a glass of water.

Stewart and Ryan studied the effect of 14 substances on the emptying of the gall bladder and found that the most effective is oleic acid. No action was obtained from castor

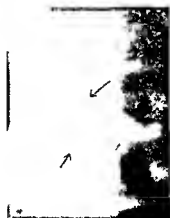


Fig 40



Fig 42

Figs 40-41—Cholesterol gall stones

oil, bile salts, cathartic salts, Sedlitz powder, or sodium phosphate.

Brunning found that a 10 per cent solution of barium chloride if applied locally to the exposed gall bladder of a dog causes contraction of that organ.

Schondube and Lurmann found morphine alone will stop the emptying of the gall bladder. If pituitary extract is injected before the administration of morphine, the gall bladder does not contract. If the gall bladder is in the process of emptying, the injection of morphine will stop its action. The effect of morphine

1. to cause relaxation of the gall bladder and the addition of atropin to morphin helps dilate the gall bladder

Our own physiologic studies by means of cholecystography were carried out with magnesium sulphate, peptone, pituitrin and fat. We found that magnesium sulphate introduced directly into the duodenum according to the method originally described by Lyon has the greatest effect upon the emptying of the gall bladder. In some cases for an unexplained reason gall bladder bile cannot be obtained. This has been the experience



Fig. 2—Bile ductogram magnified

also of Lyon, Hollande and others who have extensively employed this method. Pituitrin and not the method of Schondub and Kalkman mentioned above are effective in obtaining a very small number of our patients. I believe we did obtain positive evidence that the gall bladder filled with the dye after an injection of pituitrin. In this case the film was taken about fourteen hours after the administration of the dye and the gall bladder showed well but not. The effect of pituitrin were then given subcutaneously in half a cc. of a 1% solution of the gall bladder was obtained.

We are aware that low absorption from the intestines often causes a delayed gall bladder shadow but in the case quoted the density of the gall bladder shadow after the pituitrin injection was so striking that we are inclined to attribute it to the fact that the pituitrin had actually emptied the gall bladder before it filled with the bile containing the dye (Figs 424 and 425)

Pribram Gruenberg and Straus assert that pituitrin has a marked effect upon the emptying of the gall bladder and on this basis advocate its employment before the administration of the



Fig 423—After drainage of gall bladder empty

dye but this could not be confirmed by us. We studied the effect of food upon the emptying of the gall bladder and like the authors quoted above found that fat has the greatest effect. Oil did not have the same effect. The barium buttermilk meal likewise caused rapid emptying of the gall bladder.

Rachalsky advocates the use of tetraiodophenolphthalein in combination with bile salts on the theory that the bile acids stimulate secretion of bile and thereby increase the concentration of the dye in the gall bladder casting a much better shadow. By this method the percentage of gall bladder shadows marked

elly increases and the time in which the shadow is obtained is somewhat shortened (eleven to thirteen hours). The capsules are named videofludraec (Simmons Chemical Co. Berlin)



Fig 44—Gliblidd h t fild h dy



Fig 425—O h f p gliblidd lized

Bru ch ad oate th ombinat on f th dye w th at plan because atophan inc ases th bul s etu

It is ev dent fr m wh t h be t t d th t Col an l h s

co worker have furnished us with a valuable method of studying the function of the gall bladder. Untiring effort have been made to determine the functional capacity of practically all organs of the body. It is well known that each more or less successful functional test of an organ brings forth great enthusiasm. Unfortunately, as evidenced by the innumerable functional tests of the liver, heart and kidney etc. most have not yielded the practical results expected. The vital organs of the body like the heart, kidney, lung and liver etc. are endowed with such a margin of safety that a good part of the organ may be diseased without much disturbance in function, particularly if the disease is of a chronic and slowly progressive nature. That is why even sensitive functional tests often fail to reveal the extent of a pathologic lesion of a respective organ.

Organs like the teeth, tonsil, appendix and gall bladder, on the other hand—which can and in case of disease must be dispensed with and whose vital importance is limited—when a pathologic state causes more local and reflex disturbance than vital organs. It is reasonable to assume therefore that in such organs the possibility of determining their function would offer a great deal of information. Cholecystography to a large extent furnishes such a method.

**Functional Tests of the Gall bladder**—Based on the known physiologic facts outlined above, the procedure in the study of the function of the gall bladder is as follows:

Fifty c.c. of a 33 per cent solution of magnesium sulphate (Lyon) or 75 c.c. of a 5 per cent peptone solution (Stepp) are introduced intraduodenally after the gall bladder is visualized. The magnesium sulphate solution according to Meltzer relaxes the sphincter of Oddi and causes contraction of the gall bladder. If magnesium sulphate fails to reduce the size of the gall bladder, it may be assumed that spasm of the sphincter exists. Recent studies of Chiray and Pavel showed that the main effect of magnesium sulphate is to cause contraction of the gall bladder.

Peptone solution empties the gall bladder by causing muscular contraction of the organ (Figs 426 and 427). If peptone therefore fails to empty the gall bladder, it is reasonable to assume

that the organ is in a state of atony. Renaud advocates the employment of magnesium sulphate in a hypertonic gall bladder. The advantage of the intraduodenal method in testing gall bladder function is that it enables us to obtain the contents from the gall bladder for cytologic and chemical study.

If magnesium sulphate is given by mouth it does not empty the gall bladder because as is well explained by Chauray and Pavel it mixes with gastric contents and therefore does not reach the papilla of Vater in the same concentration. The



Fig. 46—B f. pept



Fig. 47—Gall bladder empty after pep

administration of bicarbonate of soda or plain water intraduodenally has hardly any effect upon the emptying of the gall bladder.

A very simple method of studying the emptying action of the gall bladder is the demonstration of the Boyde fat meal or 4 to 6 ounces of sweet cream and tyrovolks feces. Within a half to one hour the gall bladder is considerably reduced in size (Figs 428 and 429).

The effect of pituitrin in emptying the gall bladder as a

functional test has been very uncertain in our experience and therefore is seldom employed. In case of hypotonic gall bladder if the organ fails to empty 2 c.c. of pituitrin intramuscularly may be tried.

If the above functional tests are not employed the shadow of the gall bladder which after oral administration is visualized in twelve to sixteen hours at most in eighteen hours disappears entirely after thirty-six hours.

**Diagnostic Importance of Cholecystography**—Cholecystography has taught us that the position of the gall bladder is not



Fig 49—Biliary mass



Fig 49—Oblique view of mass

as uniform as it was thought to be. Lane rightfully states that the gall bladder region is given in Meigs' Anatomy, which is in the right hypochondrium and epigastrium region and lies in the line that separates the hypochondrium and epigastrium above and the second lumbar vertebra below. Actually contains the gall bladder in only 25 per cent of the cases. The gall bladder may lie far to the right of this line or as much outward as the axillary region of the abdomen. Such a laterally lying gall bladder will cause right pain in the right iliac region.



is mentioned by Lange in 2 cases. In 15 per cent of the case the gall bladder is seen below the right hypochondriac region. Usually it descends into the umbilical region but at times may descend into the right lumbar region occasionally be near so much to the right in the lumbar region as to simulate a right kidney.

The mobility of the gall bladder is from 1 to 1 1/2 inches. Its position like the rest of the abdominal viscera often corresponds to the status of the individual. It is situated much



Fig 430—Gall bladder in high position



Fig 431—Gall bladder in low position

higher in the sthenic and much lower in the asthenic person. It must be emphasized that quite often the gall bladder may be situated high in the abdominal cavity despite position of the rest of the abdominal organs. Cases are encountered where the lower border of the gall bladder reaches the crest of the ilium and even although the rest of the abdominal viscera are in normal position. If this is the case one may conclude that atony of the gall bladder exists and in the presence of the symptomatic pointing to it.

the gall bladder is of great diagnostic aid. The mobility of the organ is much more marked in asthenic than in the sthenic individual. In order to study the mobility of the gall bladder in each case of ptosis of the organ films should be taken in the erect and reclining positions. If the gall bladder is ptosed and not situated low because of enlargement or adhesions it moves up in the reclining position from 3 to 4 inches. In many cases it is much nearer the spinal column.



Fig 432—Gall bladder in erect position



Fig 433—Patient in reclining position with gall bladder

Figuer studied the gall bladder in 10 normal persons, 6 men and 13 women. Like other authors he found that its shape is variable. In 7 cases he found it pear shaped, in 2 it was cylindrical, in 2 apple shaped, in 2 spindle shaped. The boundaries were well defined in all cases. He measured the size of the gall bladder by comparing its length with that of individual spinal vertebrae. In one case it had the length of the spinal vertebra. In half of the remainder of the cases its length was that of 1 vertebra and in the other half that of  $1\frac{1}{2}$  vertebrae. The position of the gall bladder was as follows. In 7 cases it was lying on top of the psoas muscle, in 9 at the

border of the gall much in 3 it was at the border of the gall bladder. The lower border of the gall bladder in 9 cases was on a level with the transverse process of the third lumbar vertebra in 2 cases on a level with the first lumbar vertebra in 4 on a level with the second vertebra and in 4 more on a level with the fourth lumbar vertebra. It was found somewhat lower in women than in men and the author concludes that in most normal cases it reaches either the first or the second lumbar



Fig 434—Gall bladder specimen



Fig 435—Gall bladder specimen

vertebra with the first lumbar vertebra and at times even the fourth lumbar vertebra.

The length of the gallbladder is usually not uniform. It varies from 10 to 15 cm. It is pointed out by Herrmann that the fact that the upper part is covered by the liver because the projection of the gallbladder is filled with the bile duct of the liver but is located in the fact that it is the first part of the

quantity of the dye is present in the fundus of the gall bladder. It is not advisable to draw any definite conclusion from the size of the gall bladder although it may be said that if in an individual of normal habitus or in an asthenic individual a very large gall bladder is seen overdistention of the organ may be diagnosed.



Fig. 436—Overdistention of gall bladder.



Fig. 437—Mottled shadow of gall bladder.

If upon repeated examination a very small gall bladder shadow is seen it is reasonable to suspect that the gall bladder is contracted. Not infrequently the gall bladder shadow together with the large duct can be outlined by means of the dye. In addition to the gall bladder shadow mottled areas of the liver may be encountered adjacent to the gall bladder duct the dye scattered in the liver. In cases where the gall bladder shadow is not clearly outlined this mottling of parts of the liver may multiply the gall bladder. It can however

border with the gall bladder in 3 it is at the border of the  
 final vertebra. The lower border of the gall bladder in 9 cases  
 was on a level with the transverse process of the third lumbar  
 vertebra in 2 cases on a level with the first lumbar vertebra  
 in 4 cases on a level with the second vertebra and in 4 more on a level  
 with the fourth lumbar vertebra. It was found somewhat  
 lower in women than in men and the author concludes that in  
 not normal cases it reaches either the first or the second lumbar



Fig. 434—Gall bladder, female specimen.



Fig. 435—Gall bladder, male specimen.

vertebra. The distance from the third lumbar vertebra and  
 the time of the fourth lumbar vertebra.

The length of the gall bladder is a rule not  
 uniform and it may be found in the right full  
 pointed out by H. R. M. It is to be noted that the upper  
 part is covered by the liver because the absorption of the  
 gall bladder is called the duct. It is to be noted that the  
 liver but is due to the fact that the liver is a larger

quantity of the dye present in the fundus of the gall bladder. It is not advisable to draw diagnostic conclusion from the size of the gall bladder although it may be said that if in an individual of normal habitus or in a sthenic individual a very large gall bladder is seen overdistention of the organ may be diagnosed.



Fig. 436—Contracted gall bladder



Fig. 437—Contracted gall bladder

If upon repeated examinations a very small gall bladder shadow is seen it is reasonable to suspect that the gall bladder is contracted. Not infrequently the gall bladder shadow together with the large duct can be outlined by means of the dye. In addition to the gall bladder shadow mottled areas of the liver may be seen, suggesting the gall bladder due to the dye scattered in the liver. In cases where the gall bladder shadow is not clearly outlined this mottled appearance of the liver may simulate a gall bladder. It can be



Fig 438—C II bl dd h d tl



F 439—K d h pc i g II bl dd

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gall bladder shadow. Some authors assert that irregularity of the border of the gall bladder signifies adhesions in every case. We do not think this can be applied to every case because the irregularity in some cases may be due to the pressure of gas contained in the hepatic flexure or ascending colon. This often causes concavity of the inner border and sometimes of the outer border. In some cases the gall bladder—on account of the pressure of gas—may be half moon or kidney shaped.



Fig. 440—Hourglass gall bladder

Deformity of the gall bladder due to disease has been reported by many authors. We had occasion to observe a case which was confirmed by operation. The gall bladder in this case was hourglass in shape (Fig. 440).

Levine reported three enormous gall bladders which he attributed to congenital origin. One of hourglass shape, another resembling phrygian cap, and the third rudimentary gall bladder which appeared as a shadow on the gall bladder of rudimentary



morphology. In this patient the gall bladder also conformed to that variety of abnormal development known as the thymic type.

In order to study the relationship of the gall bladder to the duodenum it is necessary to take film immediately after the administration of the contrast meal because the gall bladder frequently empties about fifteen minutes after the contrast meal is given. If this method is employed it is sometimes possible to detect an irregularity of the duodenum in its close



Fig 44—head of the gall bladder



Fig 45—Oblique position

relationship to the gall bladder indicates the difference between the two organs. This however is not frequently as was thought before the era of cholecystography. Cholecystography has taught us also that the anastomosis of the lower portion of the duodenum with its accessory wall is

considered such a valuable sign of disease that the gall bladder is not necessarily so. When a contraction of the descending portion of the duodenum is not frequent it is much more often encountered a distance away from the shadow than near the head with the indication that the anastomosis bears no

relationship to adhesions of the second portion of the duodenum to the gall bladder. Cholecystography enables us to determine with absolute certainty whether shadows in the gall bladder region belong to the gall bladder. The shadows without the aid of cholecystography would surely have been interpreted as being due to stones in the gall bladder.

The question as to whether any diagnostic importance can be attached to the time of filling and emptying of the gall bladder cannot be answered with absolute certainty. If the filling of the gall bladder is delayed beyond eighteen hours and emptying does not take place before seventy-two hours it may be attributed to disease of the gall bladder provided delayed absorption of the dye from the colon and liver can be excluded.

The failure of the gall bladder to fill is of great diagnostic importance. The following are essential requisites for the casting of the gall bladder shadow with the dye.

- 1 Capsules must dissolve
- 2 Dye must disappear from colon to be reabsorbed by the liver
- 3 The liver must excrete the dye into the gall bladder
- 4 The duct must be open
- 5 The consistency of the bile must be such as to be fit for absorption in the gall bladder
- 6 The concentrative and absorptive power of the gall bladder must be intact
- 7 The dye should not pass out through the kidneys

If these requirements are fulfilled one should expect the gall bladder to be visualized in all cases.

Graham Cole and Copher state that the intravenous administration of the dye brings about filling of the gall bladder in 96 per cent of the cases. The oral administration as shown by the studies of Lange and most other authors fills the normal gall bladder in 80 per cent of the cases. No satisfactory explanation can be offered why a normal gall bladder does not fill with the dye. Various theories have been advanced but these are only conjectures. Bacter states that the reason it cannot be visualized when apparently normal is because

of the spasticity of its musculature resulting either from chronic appendicitis, pancreatitis or spastic colitis. It is our belief that in case where the gall bladder is not visualized after repeated examinations especially after the intravenous method functional disturbance of the gall bladder exists. This may be due to one of the anatomical anomalies such as hypertrophied heteran fold in the cystic duct (Schmieden Rhode) mucous fold in the cystic duct (John Berg) disturbance in the absorptive power of the mucous membrane of the gall bladder or to spasticity of the sphincter of Oddi resulting from imbalance of the vegetative nervous system (Weitzel). It may also be due to temporary disturbance in the consistency of bile in the liver carrying the dye to the gall bladder which prevents its absorption by the gall bladder. The studies of Judd in the Mayo Clinic proved that a gall bladder may cause symptoms as a result of disturbed function although the pathologic changes are insignificant. He named this Gade I disease of the gall bladder. It must therefore be assumed that if the gall bladder fails to fill dysfunction of the organ may be diagnosed without the presence of any gross pathology. It must be emphasized that the position of the gall bladder may sometimes interfere with the visualization of the gall bladder containing the dye. In such case the taking of films in the oblique and standing position will bring out the gall bladder shadow.

If the gall bladder does cast a perfectly normal shadow it is no indication that it is free from disease. Carman rightly pointed out that even definitely diseased gall bladder may occasionally be well visualized with the dye. He stated also that the most serious factor—the elusiveness of a negative diagnosis is the possibility of the presence of pathologic changes in the gall bladder probably arising from more pronounced disease in the past. Such a gall bladder may be found to be normal but if the history and the symptoms warrant its removal microscopic examination usually proves it to be pathologic. Richter also warns that the gall bladder should not be considered normal if cholecystography fails.

It has been our experience that diseased gall bladder may

cast perfectly normal shadows & long as the ducts are open and the absorptive property of the mucous membrane is intact. Quite often the gall bladder casts only a very small rounded shadow showing that only part of the organ contains the dye. At times the shadow is densest not in the fundus but near the ducts or in the center of the gall bladder. Such finding would indicate that the diseased process of the mucous membrane of the gall bladder which interferes with the absorptive power of the dye is not equally distributed throughout the entire organ.



F 443

If on repeated examination the density of the shadow is very slight or if there is a mottled appearance (Cameron) disease of the gall bladder may be diagnosed. In such case it must be concluded that the trouble does not lie in the ducts because the entrance of the dye into the gall bladder as well as its passage from the gall bladder is not interfered with but it proves that the contractile and absorptive power of the gall bladder is reduced.

The visualization of stones in the gall bladder by means of cholecystography is not as frequent as one would expect. In



Fig 444—Gall bladder held against light to show contents



Fig 445—Gall bladder held against light to show contents

many of the cases the gall bladder is enlarged and the tone is seen. This tends to prove that in some cases gallstones may be present in a gall bladder for the first time which is rare.



Fig 446—S wall of gall bladder. Fig 447—Gall bladder. Fig 448—Gall bladder. Fig 449—Gall bladder. Fig 450—Gall bladder.



Fig 44—Sagittal view of gall bladder. Fig 446—Anteroposterior view of gall bladder.

From a cholecystographic standpoint. At time the stones are best visualized at the level of the cholecystographic shadow diminishes. The stones may be from twenty to twenty four

hours after the administration of the dye. Cholesterinized stones (Figs 444 and 445) are very frequently visualized only by means of cholecystography as pointed out by Gagnon and Moore. These shadows are usually circular in outline of varying sizes with dense capsules and often the radial arrangement of centers can be seen. Great caution must be taken in interpreting these shadows because small collections of gas in the hepatic flexure overlying the gall bladder can easily be mistaken for cholesterinized stones in the gall bladder. In order to avoid such an error films should be taken of the patient in the oblique



Fig 448—Gall bladder in frontal position containing bilirubin



Fig 449—Same as Fig 448 but buccal position

position in all doubtful cases. Stone containing gallstones and bilirubin are also far more accessible to the cholecystographic method than was previously possible (Figs 448 and 449). Stones containing an excess of calcium are more easily detected. The cholecystographic method in the gall bladder will well offer an opportunity to study the distribution of the dye.

Smithies and Oleson state that the dark white film is a light density which is seen on the roentgenogram. It is brought out more clearly if the patient is made to lie on their side that of the ordinary side. In the case of the patient with

stones are found in a gall bladder which failed to cast a shadow by cholecystography. This may be due to the fact that the density of the shadow caused by the dye is equal to that of stones and therefore it is not possible to differentiate the calculus shadow from the rest of the gall bladder.

Absolute requisites for the interpretation of the gall bladder by means of the dye are a fairly good outline of the last two ribs, visualization of the transverse process of the eleventh to the twelfth and first to the fourth lumbar vertebrae and also visualization of the lower border of the liver.

The following may be mistaken for stones in the gall bladder: Renal and pancreatic calculi, border of psoas muscle, calcified mesenteric gland, fecal concretions, calcified cysts in the liver, foreign bodies, calcification of costal cartilage, small collection of gas in the hepatic flexure and duodenum, certain conditions of the skin such as calcified papillomatous patches, calcified tuberculous kidney and calcified right suprarenal body.

**Contraindications to the Use of Cholecystography**—Regarding contraindications to the use of cholecystography the experimental studies of Reid and Whitaker are very important. They experimented with the intravenous injection of tetraiodophenolphthalein and later with tetrabromophenolphthalein. From their first series of experiments on dogs they concluded that cholecystography is negative with sodium tetraiodophenolphthalein in dog in which the liver lobule is extensively damaged by chloroform. Dogs in whom the liver shows central necrosis occupying more than half the lobule tolerate the drug fairly well. Starving the animal for three days and then administering small amounts of chloroform over half an hour leads to extensive damage of the liver. Their second series of experiments led them to the conclusion that extensive lesions of the liver interfere with its excretory function and consequently also with cholecystography. A moderately damaged liver however does not interfere. In a third series of experiments the dogs were not starved but only treated with chloroform as in the first and second experiments. Clear shadows of the gall bladder were obtained in these animals by means of cholecystog-



raphy. This seems to indicate that starvation is apparently one of the principal factors in the production of liver damage by the use of chloroform. It can be learned also from their experiments that hepatic disease in human beings should not necessarily preclude the employment of the dye for purposes of cholecystography.

It must be emphasized that where extensive liver disease is present cholecystography should not be used and even in moderately severe diseases of the liver if the method is employed it should be done in hospitals or clinics. According to Carman the dye should not be used in decompensated alvular disease particularly if there is marked congestion of the liver and also not in advanced arteriosclerosis. Oakman states that the dye appears to be contraindicated in pyloric obstruction, common duct obstruction and cirrhosis of the liver.

The effort of Graham Cole and Moore to find a substitute which would prove practical not only for visualizing the gall bladder but also for giving sufficient color to the blood to permit its use for a test of hepatic function in a manner similar to the test by Leibel. Roese and others who employed phenoltetrachlorophthalin have been described above.

For complete sake we must mention that Sabatini and Villani in Italy advocate the employment of bromide or iodide alone for visualization of the gall bladder. Either salt may be used in 2 gram dose dissolved in 100 cc of water.

Hirsch and Taylor rightly state that despite all its advantages this diagnostic procedure has not yet been standardized. It must be stated that no method of diagnosis is absolutely perfect neither the micropipette nor the stethoscope nor any other method. The Graham dye method does not replace the other clinical methods but it certainly has been a great step forward in the diagnosis of gall bladder disease and affection of the large duct. By the administration of the dye after the removal of the gall bladder a number of cases have been reported where the common and hepatic duct as well as the small ducts could be well visualized.

**Gall bladder Study Without Dye**—Gall bladder study with

out dye received a great deal of attention following the encouraging reports of George and Leonard Case, L. G. Cole and Knox. It was reasonable to assume that the detection of stone in the gall bladder by means of Roentgen ray would be equally as possible as the detection of renal stones because stones in the gall bladder have a greater absorptive power for the rays than the surrounding tissues liver and gall bladder. This, however, proved not so. The experimental work of Knox and of Cole who tried to determine how a variety of gall stones when removed from the body would appear on a photographic plate when suspended in air, water and bile gave great impetus to the expectation that all stone rich in calcium would cast shadow. Cole proved that only 26 per cent of the stones showed a trace of calcium—less than the key stone which he selected for comparison—and that 54 per cent showed practically no calcareous deposits.

The cholesterol stones in his experiments appeared like bubbles of air because they were so much less dense than the bile. In cases where many cholesterol stones were photographed in the bile the bile surrounding the stones appeared denser than the stones and gave the area of the gall bladder a honeycomb appearance or ring like shadow typical of gall stones. In a later study Cole and George gave expression to the view that gall stones can be shown in almost all cases by means of Roentgen ray and that a positive diagnosis can be made in such a large percentage of cases that negative diagnosis has become more important than it was originally considered to be. Case—basing his conclusion on a study of 300 operations in which Roentgen examinations were made—states that it is possible to show gall stones definitely in 50 per cent of the cases. Carman was skeptical at first regarding the percentage of positive diagnoses of gall stones but agreed later that with the proper technique a large percentage can be reached. Caldwell protested against the making of positive diagnoses on the insufficient evidence of very indefinite shadow and stated that if only enough plates are taken it is possible to obtain the suspicious shadows in the gall bladder region of even normal individual. He believed

that the personal equation of individual observers is more important in this field of Roentgen work than in any other and that this accounts for some reporting 85 per cent of results and others only 5 per cent. George and Leonard in their excellent book state that gall stones can be diagnosed in over 90 per cent of the cases and they also formulated the working hypothesis that only when some pathologic changes have taken place in the wall of the gall bladder or its contents can the shadow be demonstrated on the x-ray plate. They conclude that a gall bladder which is visualized roentgenologically should be considered pathologic.

It cannot be denied that examination of the gall bladder region without the aid of the dye should be practiced today as it was before the era of cholecystography because stone rich in calcium can thus be better detected. In fact such stone may be missed when the gall bladder is filled with dye. The frequency however of the detection of gall stone without the dye is even today estimated differently by various workers in this field although an identical technique is employed. The percentage of positive results is small in our own experience. Whether a visualized gall bladder without the dye is to be considered pathologic is likewise not agreed upon by all authors. It is our opinion that if the gall bladder is distinctly visualized with the dye it need not be considered pathologic. It must be emphasized that shadows simulating the gall bladder may be seen in the right hypochondrium and similar shadows in the left hypochondrium. Shadows simulating stone particularly the so-called hockeycomb shadow described by Cleve must likewise be judged with great caution because of calcification or air bubbles in the hepatic flexure of the colon may cast similar shadows.

It is important that the time of exposure should be very short because the slightest breathing exercise disturbs the outline of the shadow. Perhaps we should experimentally that if the removed tube were placed perpendicular they were not motion very difficult to be obtained but the shadows were very distinct in that they were

photographed slightly in motion. The position of Pfahler (patient on abdomen body rotated to right side outward) or Carl Beck (upper part elevated) are of advantage. The tube should not be too hard. Some advise inflating the colon with gas and even inflating the stomach with air in order to facilitate differentiation of shadows in the right hypochondrium. The pneumoperitoneum as introduced by Goetze and carried out in this country mainly by Stein and Stewart offers great advantage in visualizing the gall bladder stone and adhesions in the right hypochondrium. It is however a very inconvenient procedure and must be practiced only by the most competent and in hospitals and should be resorted to only when exploratory laparotomy is contraindicated.

If shadows are visualized in the right hypochondrium and the gall bladder outline is not seen the following must be considered in the differential diagnosis:

1. **Kidney stones.** These stones are much denser and lie much nearer to the spinal column. They have different forms. In doubtful cases a plate should be taken in the dorsoventral position as advocated by Cole in which case gall tones are smaller and much more distinct. The kidney stones are seen to be much more distinct if a plate is taken in the ventrodorsal position also.

2. **Fecal tone.** These should not be confused with gall stones. These shadows disappear by repeated exposure and if the bowel are thoroughly cleaned out.

3. **Calcified deposits in the costal cartilages.** These shadows are sharper in outline elongated and are present on both sides of the chest.

4. **Calcified lymph gland.** These lie close to the spinal column.

5. **Pancreatic tone.**

6. **Calcified papillomata of the skin.**

7. **Calcified cysts of the liver kidney or suprarenal.**

**Indirect Method.**—The indirect method has as its object the demonstration of the functional reflex disturbance of the gastrointestinal tract brought about by the disease of gall

bladder and also change in the gall bladder and adjacent viscera resulting from adhesions

Carman describes the following x ray manifestations as characteristic of indirect evidence of gall bladder disease

- 1 Dextraposition of the pylorus
- 2 Peristaltic distention of the hepatic flexure with gas
- 3 Tenderness over the gall bladder region demonstrated fluoroscopically
- 4 Perfectly normal outline of the stomach and first portion of the duodenum
- 5 Small six hour residue
- 6 Pylorospasm and visualization of Riedel's lobe

Roentgenologic indirect evidence of gall bladder disease in our experience is as follows

1 Pylorospasm The spasm may occupy the entire pylorus giving it a pivot shaped appearance or it may affect only a small part of the pylorus The pivot shaped pylorus may be so persistent during repeated examinations as to simulate carcinoma In fact many such cases have been diagnosed as carcinoma Holzknecht and Lue emphasize the fact that one late feature in the gall bladder is often brought about by such pylorospasm The findings have been confirmed by many others The x ray examination in our cases could not pivot the pylorus which simulated carcinoma The operation revealed diseased gall bladder with no stone It is to be seen that such an error in diagnosis is at times unavoidable in many of the cases when an acidity is present

2 The next indirect sign of great importance is the perfectly normal stomach and duodenum without any constant pressure points the sensitive pressure point being related to the gall bladder region

3 Hyperperistalsis of the terminal duodenum and small intestine residue for four and six hours This is encountered frequently in case of gall bladder disease and the clinical symptoms suggest duodenal or gastric ulcer

4 Persistent presence of gas in the hepatic flexure with marked bloating results from dilated Riedel's lobe In the

presence of considerable gas in the hepatic flexure Riedel's lobe is distinctly outlined

5 A rare indirect sign is regional intermittent spasm of the stomach midway between the fundus and pylorus if pressure is exerted over the gall bladder region while fluoroscoping Barsony Carman Case and Hurst observed this phenomenon We also have frequently observed this spasm but we find that the spasm lasts as long as pressure is exerted over the gall bladder region and disappears immediately upon removal of the pressure We have also frequently observed marked hyperperistalsis of the stomach if pressure is exerted over the diseased gall bladder Complete gastrosplasm is mentioned in the literature as sometimes being an accompaniment of gall stones Such has never been encountered by us Whether partial regional or complete spasm of the stomach is present as an accompaniment of gall stones the symptoms of distress in the upper abdomen following the intake of food and the discomfort and even pain are due to this spasm Recently we had occasion to have 2 cases operated upon for gall stones in which cardiosplasm was present One patient had suffered from cardiosplasm for a number of years and had typical Roentgen manifestations The physical examination revealed tenderness over the gall bladder region with definite enlargement of the liver which led us to suspect gall stones as the cause of the cardiosplasm Since the removal of the stone the patient has been free from symptoms The second case gave a clinical history of periodic attacks of gall stone colic of many years standing The patient's persistent complaints however were those of cardiosplasm I S Hirsch in a personal communication called our attention to a fluoroscopic observation in gall stones namely regurgitation of the contrast meal into the esophagus This was published by his associate Dr Buckstein

6 Gall bladder disease causing adhesion in the right hypochondrium may be manifested roentgenologically in the following way (a) Distortion of the stomach (b) irregular toothlike projection of the pylorus (c) marked elevation of splenic flexure (d) looping of splenic flexure in the absence of

pto 1 of the rest of the colon or abdominal viscera (e) irregularity of the entire first portion of the duodenum especially its outer border (f) angulation of the midpart of the descending portion of the duodenum

Angulation of the descending portion of the duodenum as a sign of adhesions between the gall bladder and duodenum is considered to be of great diagnostic importance by Jewett. It was stated above that we had a great deal of confidence in this

until cholecystography demonstrated that such angulation of the duodenum may be present and the gall bladder shadow be a distance away from this angulation. Haensch pointed out that the concavity of the greater curvature of the duodenum, and sometimes of the pylorus is frequently caused by enlargement of the gall bladder. Usually the loops of the jejunum are found to the left of the median line. If they are persistently found to the right of the median line in the region of the right hypochondrium and especially if such loops are filled with gas it is reasonable to assume that this is due to adhesions and in most cases the adhesions are found between the gall bladder and the jejunum secondary to gall bladder disease.

*Conclusions*—Roentgen ray study has proved to be an invaluable aid in the diagnosis of gall bladder disease. The direct and indirect method should be employed. The object of the direct method is to visualize the gall bladder properly. This is accomplished by taking films of the gall bladder region with and without the administration of the dye. The method of Graham (cholecystography) is by far the most valuable. This method enables us to study the function of the gall bladder and also make it possible to visualize cholelithic tones in a large percentage of cases. It shows with a high degree of exactness whether the shadow in the right hypochondrium belongs to the gall bladder. The non-visualization of the gall bladder after the administration of the dye is particularly valuable as it indicates a diseased condition. The administration is reliable and permits to place the roentgen method entirely. This method is applicable to all works of interest in the field of Roentgenology.

The rectal method is of no value. The intrajejunal administration of the dye through the duodenal tube (Stewart and Einhorn) should be reserved only for such cases where the drug cannot be retained by mouth and where the intravenous method is contraindicated because of existing cardiovascular disease. It should be reserved also for cases of extreme asthenia and for very obese individuals whose cubital veins cannot be reached.

The indirect method of Roentgen ray study of the gall bladder which has as its object the determination of the functional disturbance of the gastrointestinal tract resulting from gall bladder disease should not be abandoned. The most important diagnostic signs obtained by this method are Pyloric spasm, delay in the emptying of the stomach and dextro position of the pylorus and duodenum.

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S lt Am J Roe t A g t 1925 1 p 109
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J 19 6 l 94 p 93
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ph lphth l w h Sod m T sod ph lph h l C ll bl dd  
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p 84
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p 695

